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ELECTRICAL TIMES

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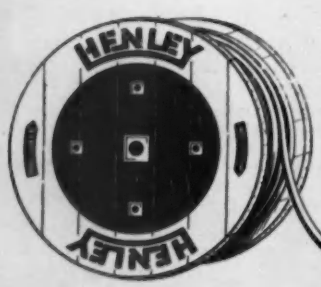

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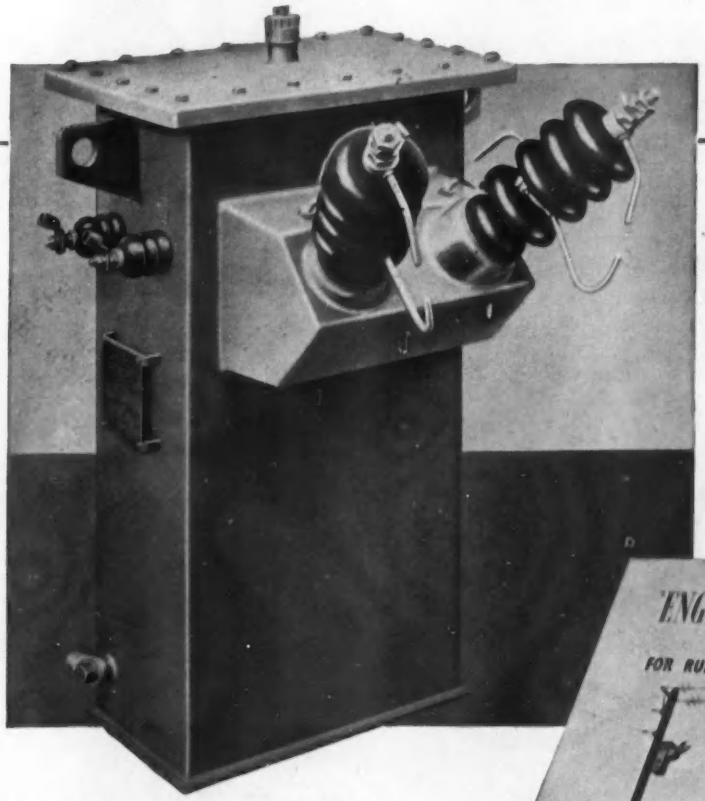

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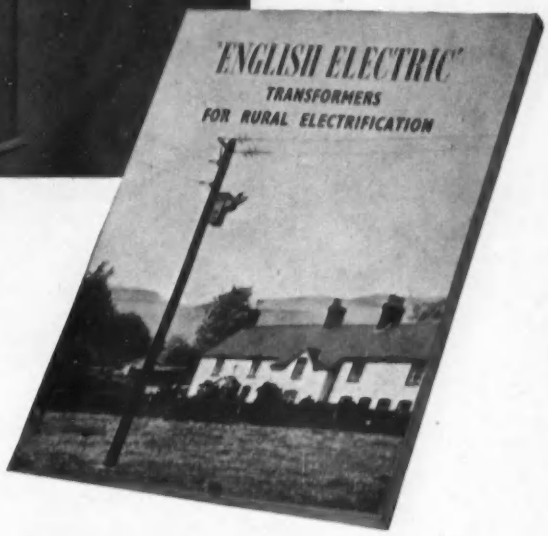

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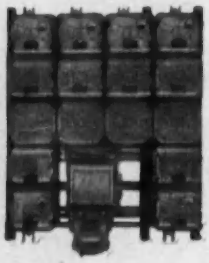

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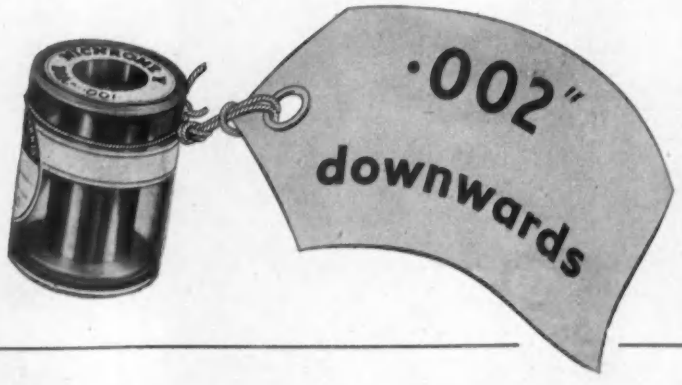

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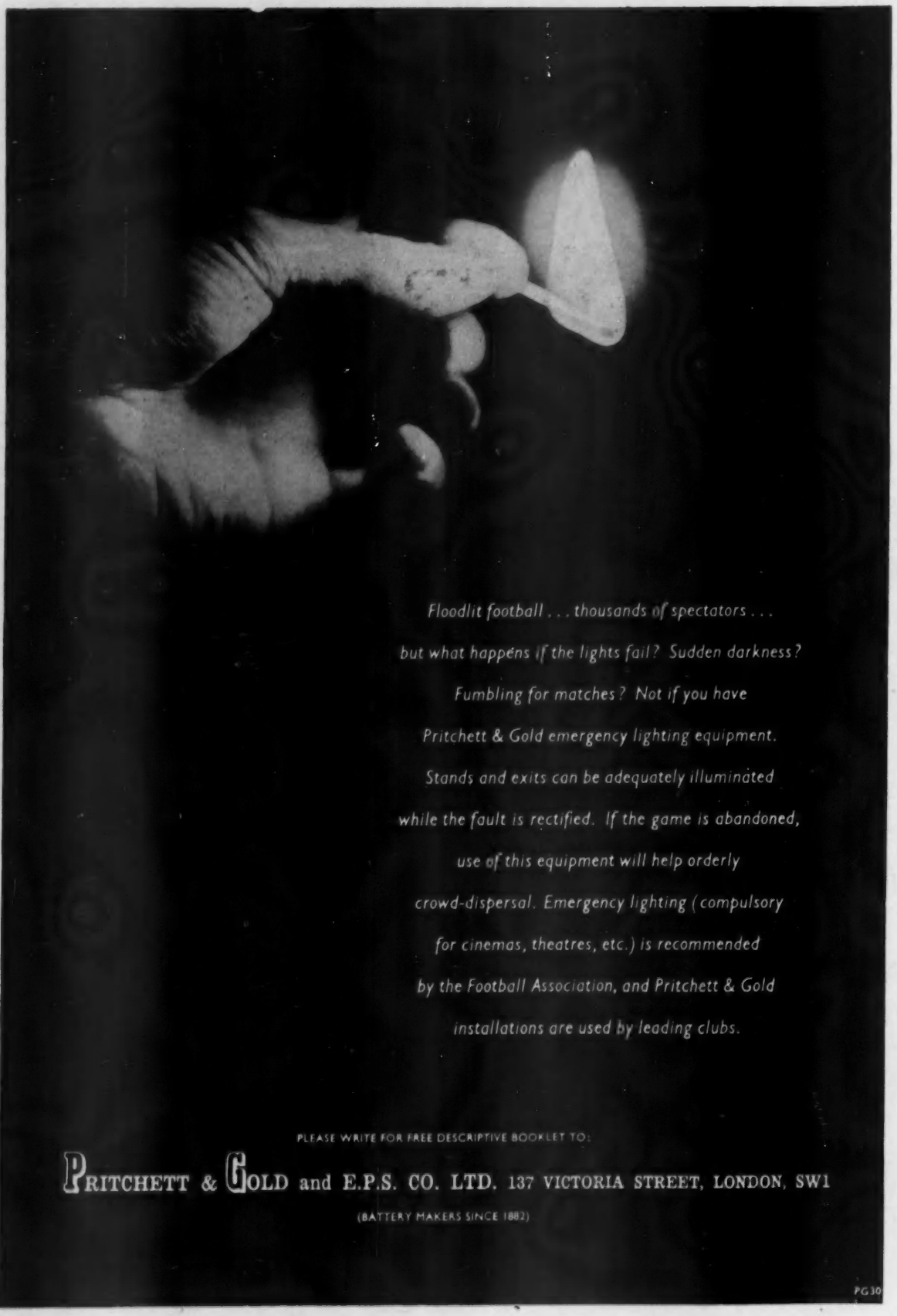
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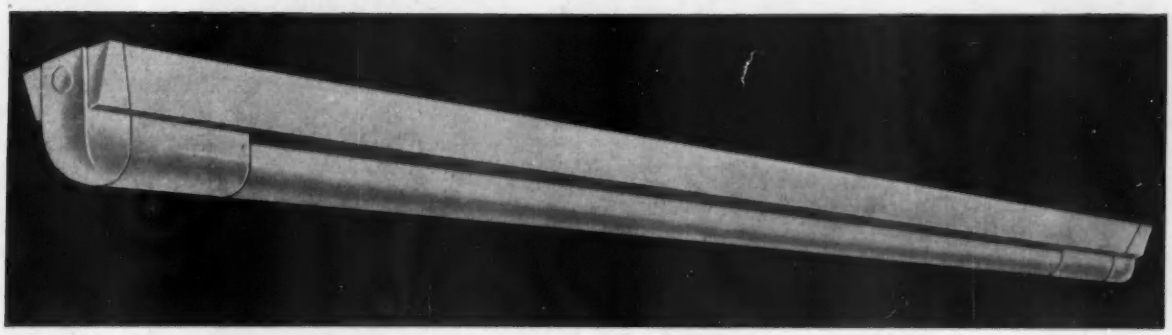

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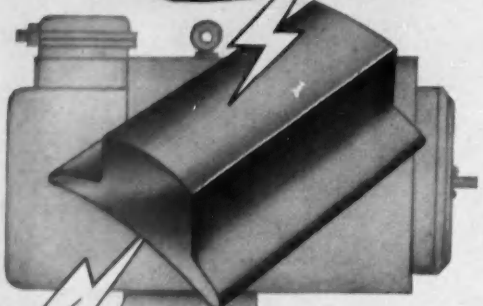

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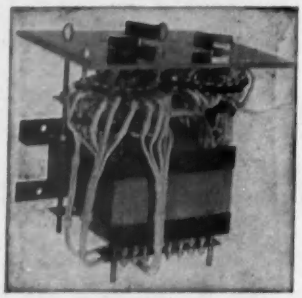

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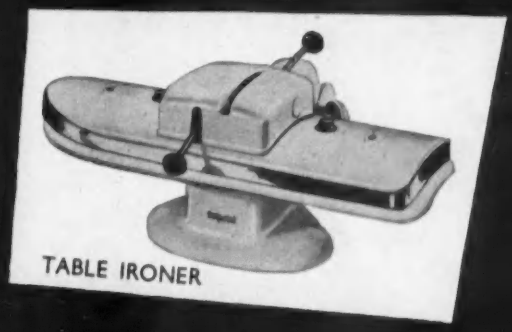
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"'TIS THE ROUNDHEADS, Sir Percy. Haste thee, Milord — jump for it!"

"But 'tis dark outside," said Sir Percy plaintively — off the battlefield he was a man of cautious disposition — "'tis wondering where to jump I am?"

"'Tis no time to ponder" retorted the Squire, "Haste!"

"Very well then, I suppose thou knowest best." Sir Percy grasped his sword, swung his cloak, and leapt into a world of darkness; he was pleasantly surprised to land on something soft and yielding. "Gad!" he beamed, "the age of miracles is not yet past." From beneath him, oddly muffled, the Squire's voice choked; "'Twould be uncommon kind of milord to remove his scabbard from the small of my back."

"Faith!" cried the cavalier — "here is a waggish situation indeed. Meseems I made a splendid landing on thy broad and faithful back. And where didst *thou* come to earth, old friend?"

The Squire squirmed uneasily. "Verily I could not swear to it, but if I mistake me not, we are in the cattleyard." His movements were accompanied by an odd squelching sound. "Verily thou wert unfortunate," said Sir Percy with soldierly sympathy — "perhaps that will teach thee the folly of a spring in the dark. And speaking of springs" — he spake with a knowledge surprising in one of that period — "Didst know that the most inferior springs may look exactly like a genuine high precision job, guaranteed for years of high performance? What! not interested in springs? Ah, well, perhaps a tub would suit thee better." He ambled off into the darkness . . .

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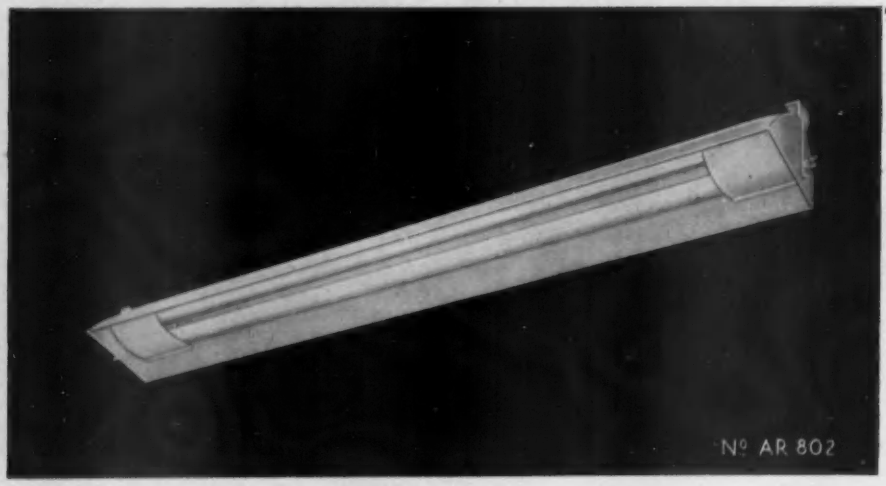

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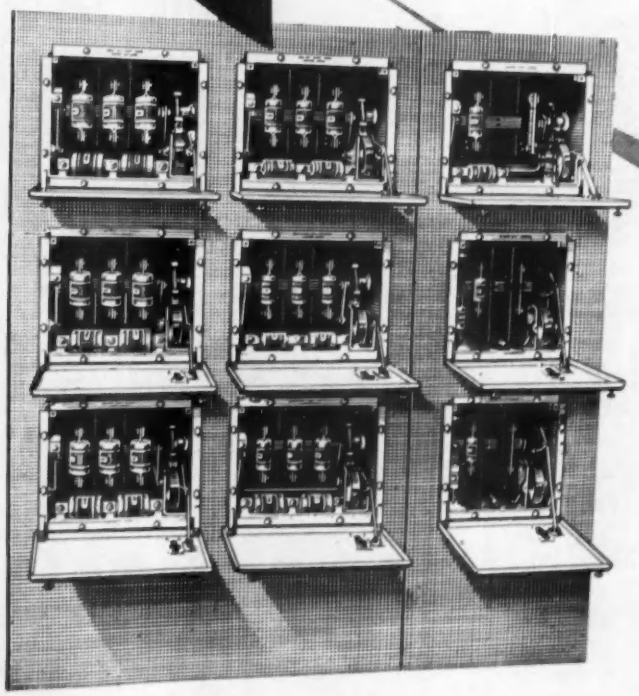

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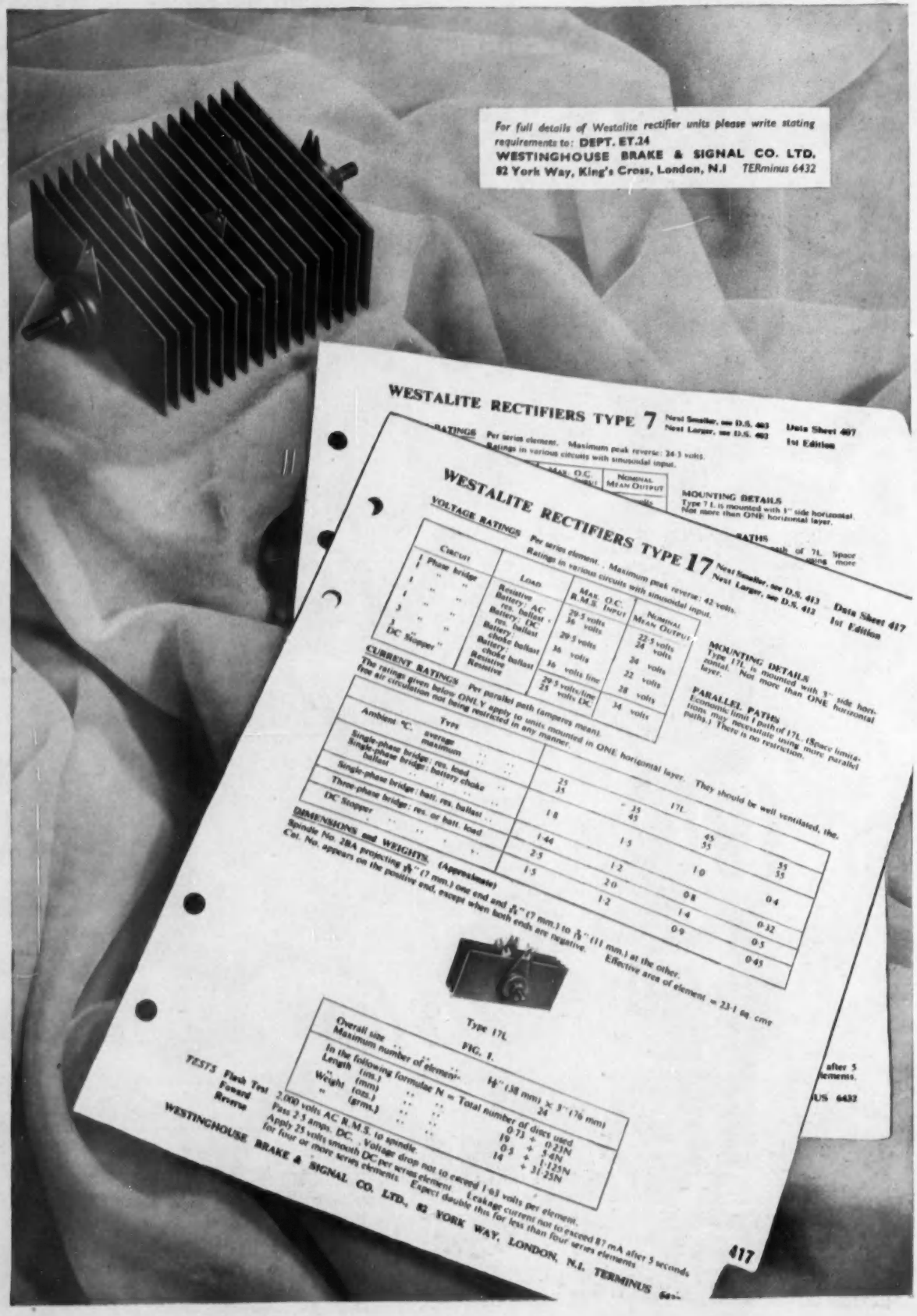
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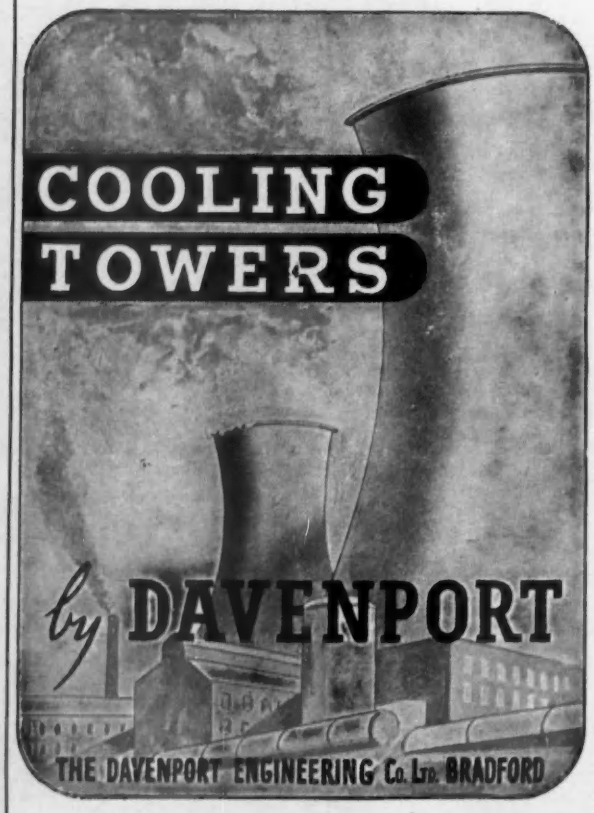

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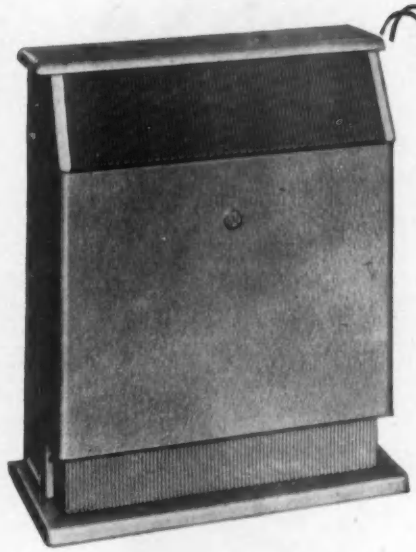

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Overall size : height 22½"; width 19½"; depth 8½"
Voltage ranges : 200/220; 230/250
Suitable for A.C. supply only

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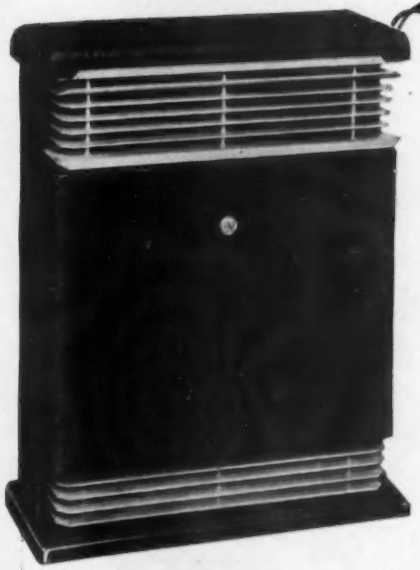

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MODEL P.20

The P.20 Convector is a highly efficient and attractive unit which has already achieved considerable success.

As with Model P.15, the venturi principle is used giving fast, even heating, accurately controlled by an adjustable thermostat fitted in the air inlet.

This year the P.20 is available in a choice of two finishes: as illustrated in a pleasing fine black crackle or in a grey hammer finish as shown on Model P.15 above. The large inlet and outlet louvres are anodised flame gold.

Model P.20 is supplied complete with 6 feet of 3-core flexible cord anchored by a cord grip attachment connected to a substantial terminal block.

MODEL P.20
Loading : 2 kW.
Overall size : height 24½"; width 19½"; depth 8½"
Voltage ranges : 200/220; 230/250
Suitable for A.C. supply only

PRICE: £11.0.0 (P.Tax £4.0.6)

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The Domestic Appliance Section of Johnson & Phillips Ltd.

NEWARTHILL · MOTHERWELL · SCOTLAND

G.E.C.

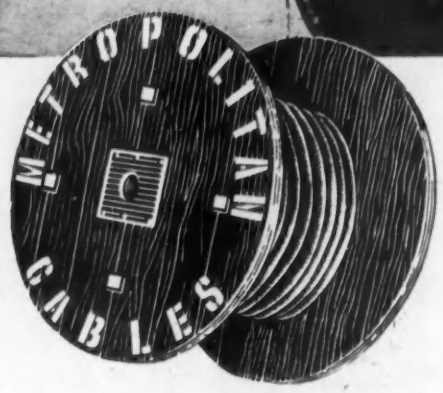
POST-TOP SMALL WEMBLEY LANTERN

This lantern has been designed for side road lighting and uses a 60-200w Osram tungsten filament or an 80w or 125w Osram mercury MB/U lamp.

New and outstanding features include :—

- Optical control is obtained by an inner prismatic glass dome refractor. It is supported by a lip at the top engaging with stainless steel spring clips, leaving the prismatic surfaces entirely unobstructed; the refractor and lamp are enclosed by a clear or rimpled outer globe made in glass or "Perspex"
- The spun and die-cast light alloy body is supplied with a cradle and post top spigot cap.
- A die-cast hinged ring with easy release catch, supports the outer globe.
- Hinged vitreous enamelled over reflector.
- The focusing device is die-cast in Mazak and lamp positioning is indicated on an embossed scale.
- Two rubber gaskets ensure that the lantern is completely weatherproof and dustproof.
- The outer globe is secured by stainless steel quick release spring clips.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



H.M.S. WEXHAM

WIRED THROUGHOUT WITH METROPOLITAN SHIPWIRING CABLE

Our picture shows H.M.S. Wexham, an Inshore Minesweeper, shortly after her launching at the yards of Messrs. James Taylor (Chertsey) Limited. This fine ship, 106 ft. in length and driven by Paxman Diesel Engines, is wired throughout with Metropolitan Shipwiring Cables.

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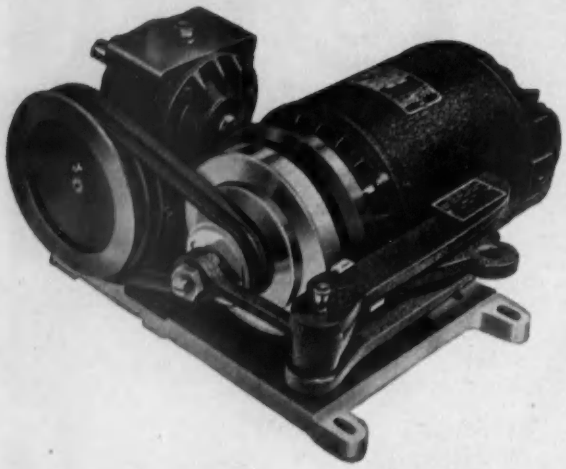
MARDRIVE REG'D

CLUTCH WORM REDUCTION UNIT



The Mardrive clutch worm reduction unit is invaluable for low speed drives where it is necessary to start and stop instantly and at more frequent intervals than is possible by direct switching of the motor.

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By the use of varying ratios of worm reducers a speed range of from 10 r.p.m. to 115 r.p.m. is readily attainable and with variations of the pulley sizes, this range can be further increased.

These fractional horse-power units are readily available for use on single-phase, three-phase or D.C. electrical supply.

The unique qualities of the MARDRIVE clutch worm reduction unit make for elimination of fatigue and an increase in both quality and quantity of production.

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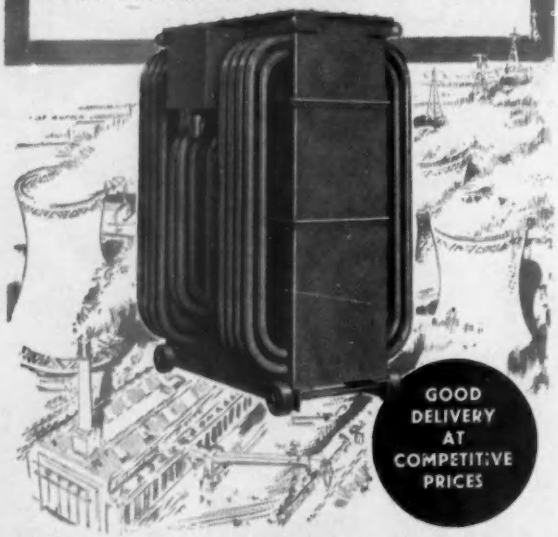

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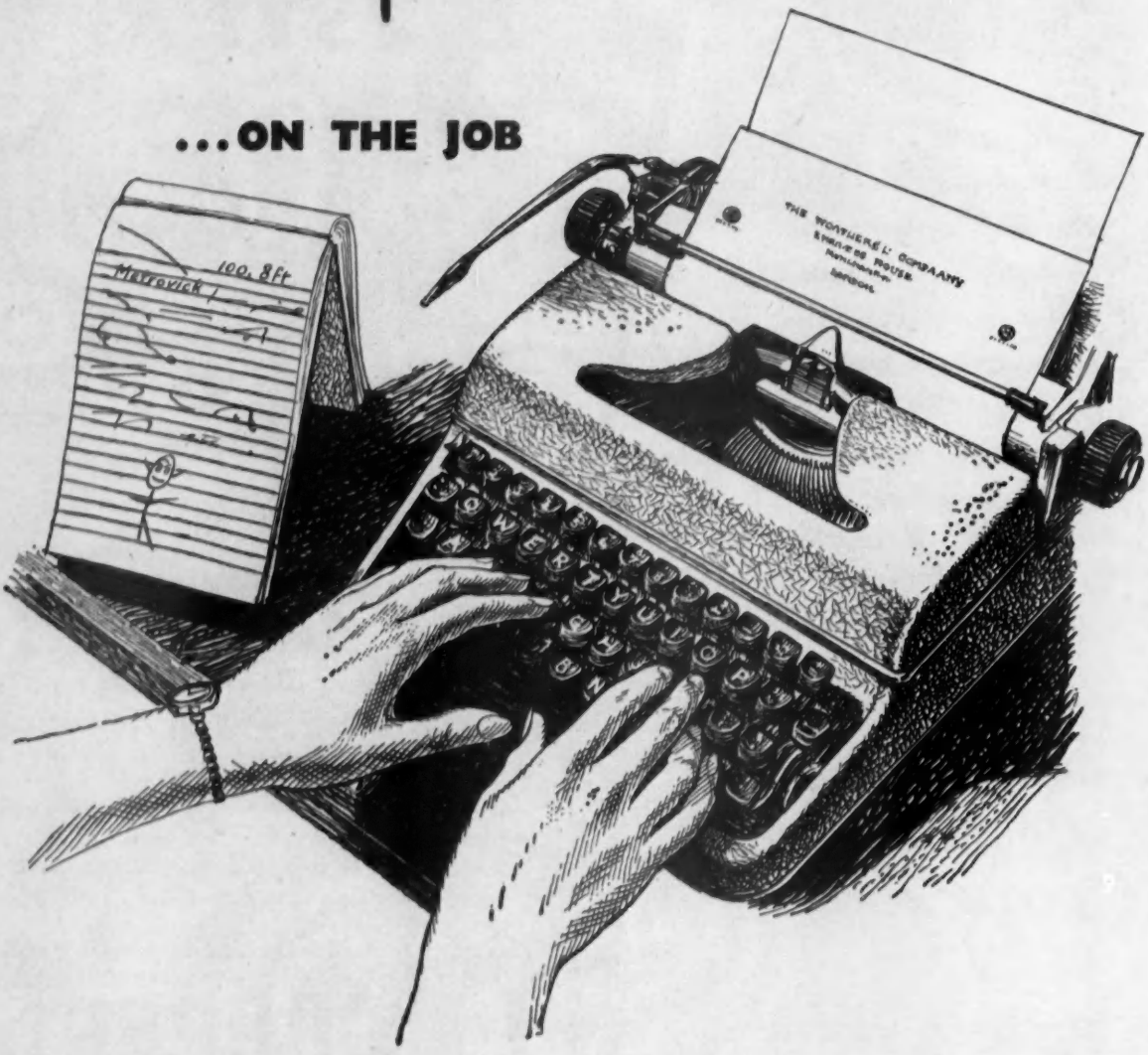

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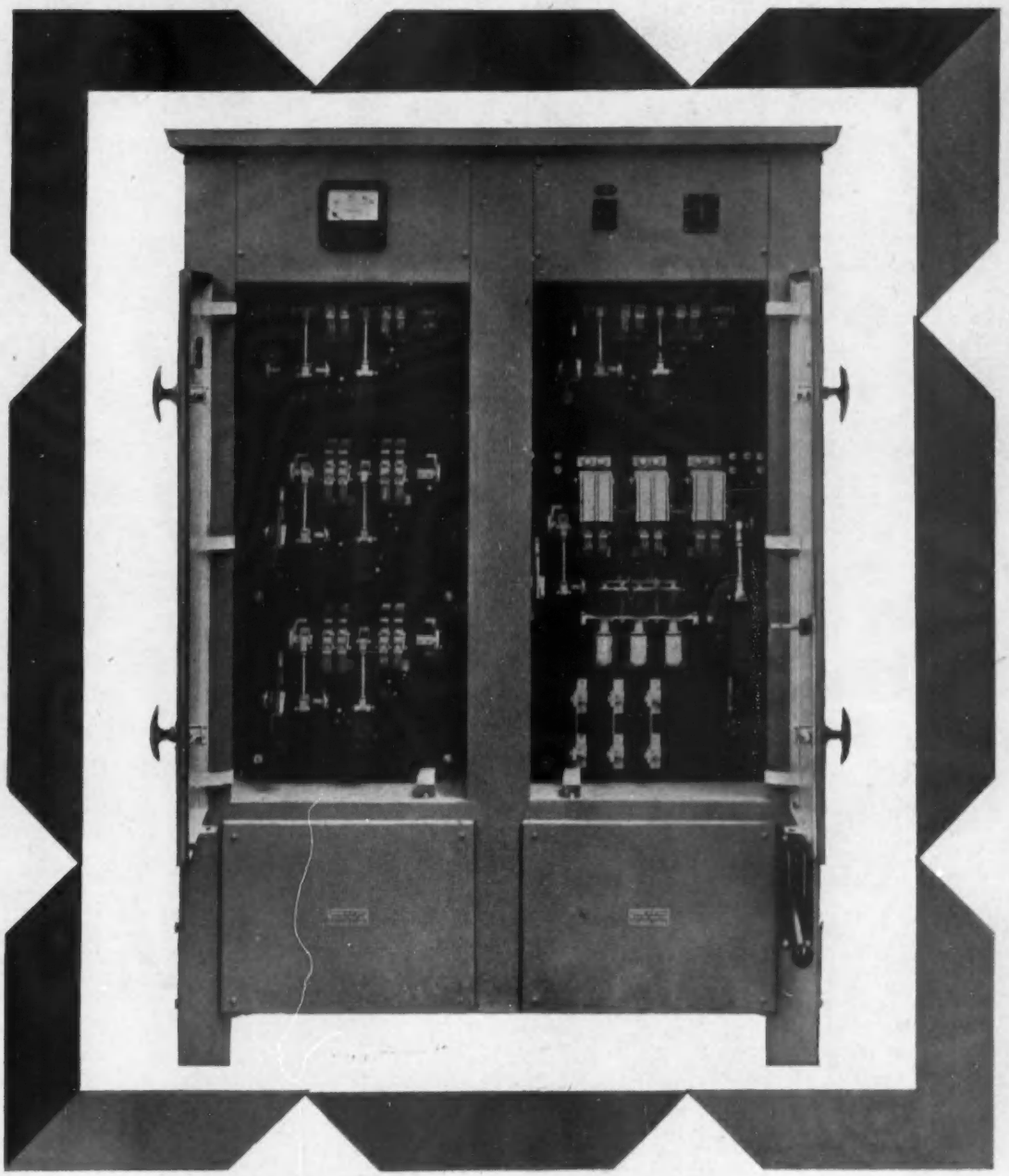

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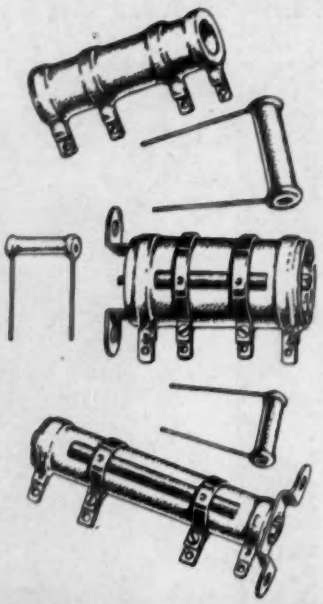

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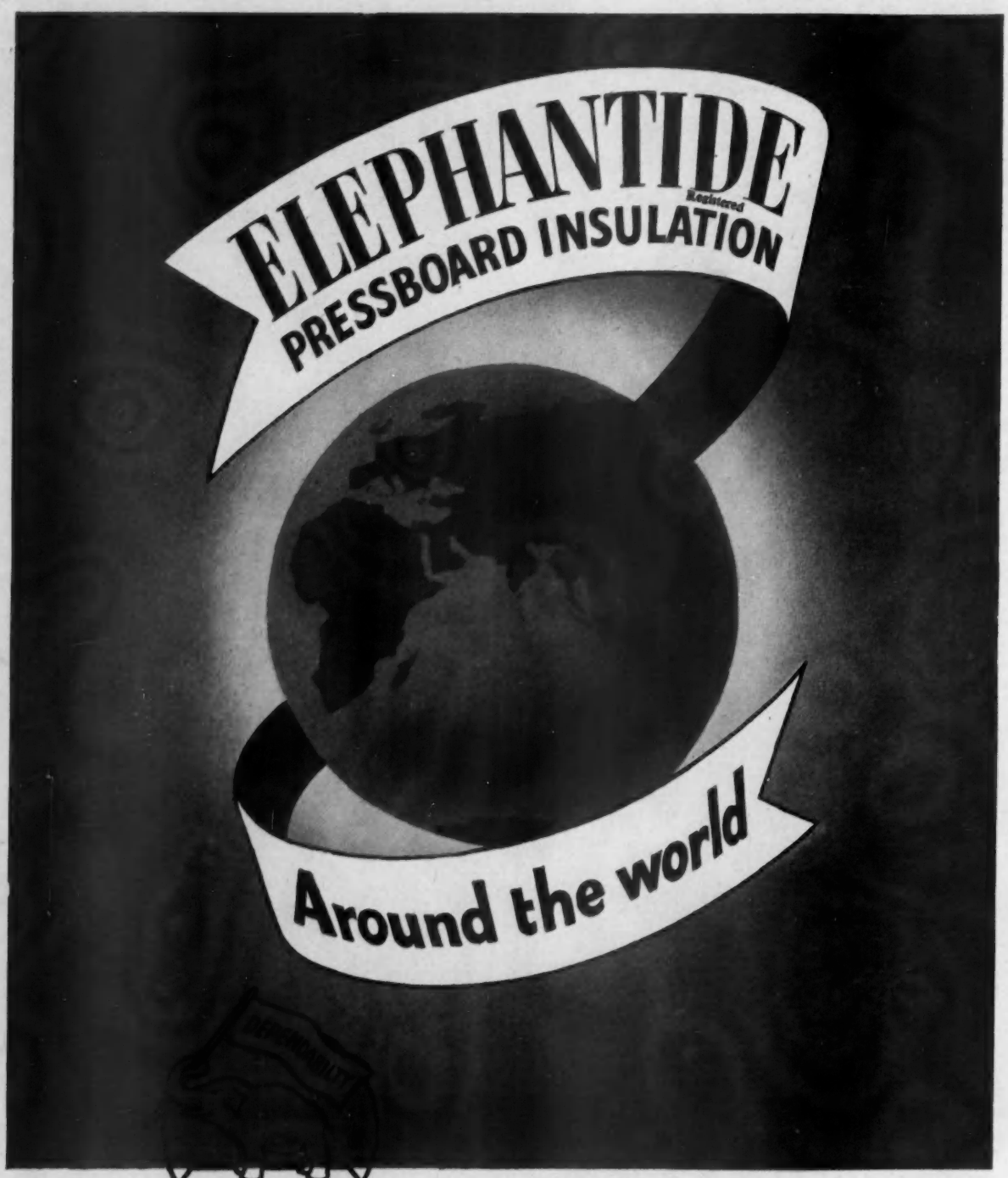

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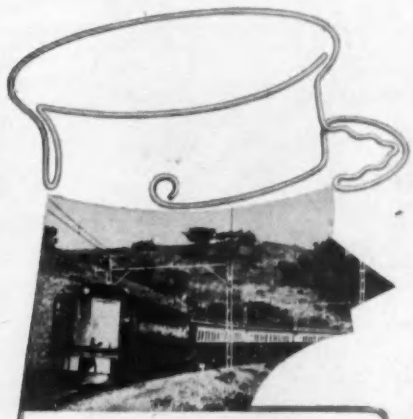
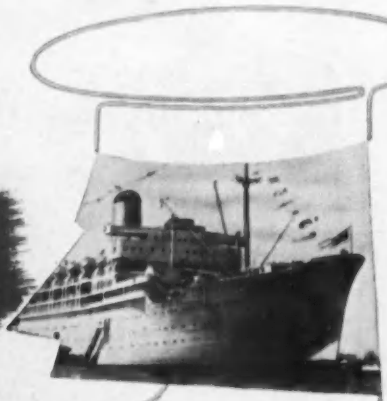


on land...



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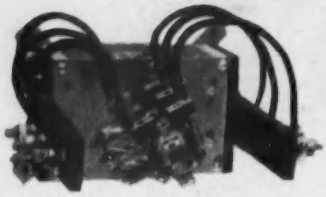

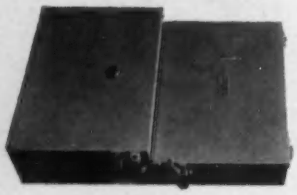

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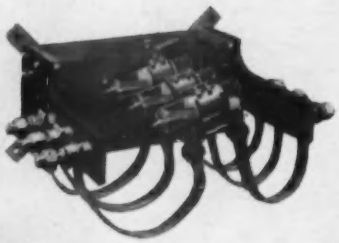

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THE CYCLONE FURNACE burns even poor-grade coals at high combustion rates, with low excess air and high ash recovery.

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Achieves high boiler efficiency due to operation with low excess air, high heat absorption because of cleaner surfaces, negligible loss of unburnt combustible and lower power consumption for coal preparation—since the coal need only be crushed or coarsely pulverized.

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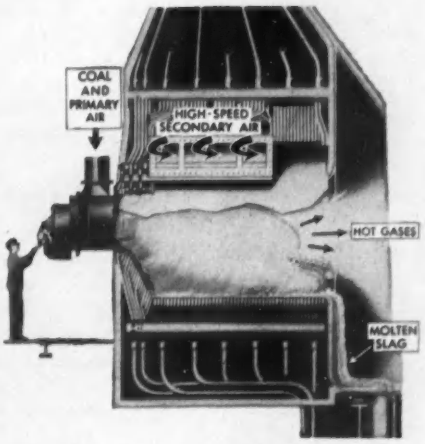
Enables greater evaporative capacity to be obtained in less total space. Smaller boilers, with less ash and dust-collecting plant and other auxiliaries, can be housed in less costly buildings.

Ideally suited to simple, automatic combustion control.



Safe in operation. Easily started-up. Ignition stable under all load conditions.

Flexible in operation to meet wide load variations. Can be arranged for alternative firing with oil or gas.

Babcock & Wilcox Ltd. have under construction and on order a number of *Cyclone*-fired boilers for both power station and large industrial installations.

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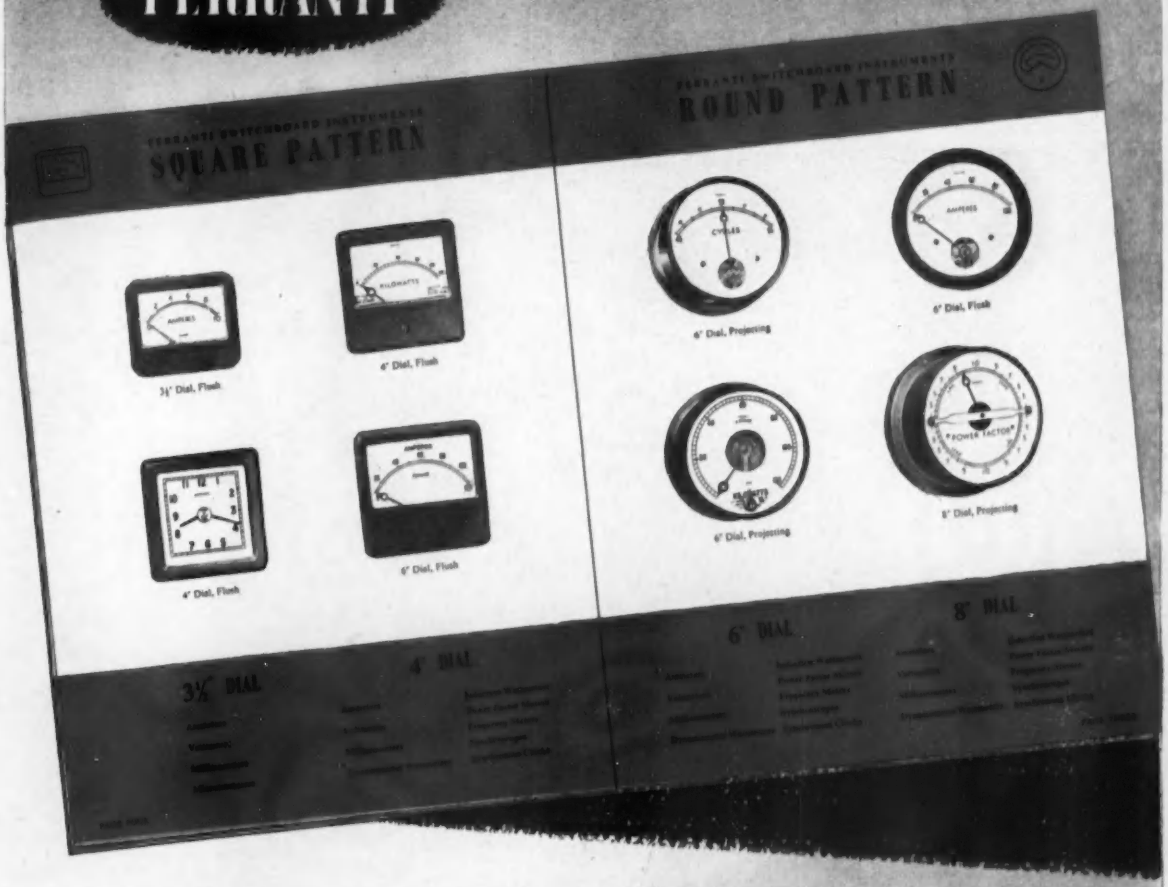
FERRANTI *Switchboard Instruments*



Illustrated above are several Ferranti Switchboard Instruments from a wide range. Shallow pressed steel cases 3½", 3½", 4", 6" and 8" round or square dial. Projecting or flush mounting. All types of Ferranti switchboard instruments are also available in hermetically sealed cases.

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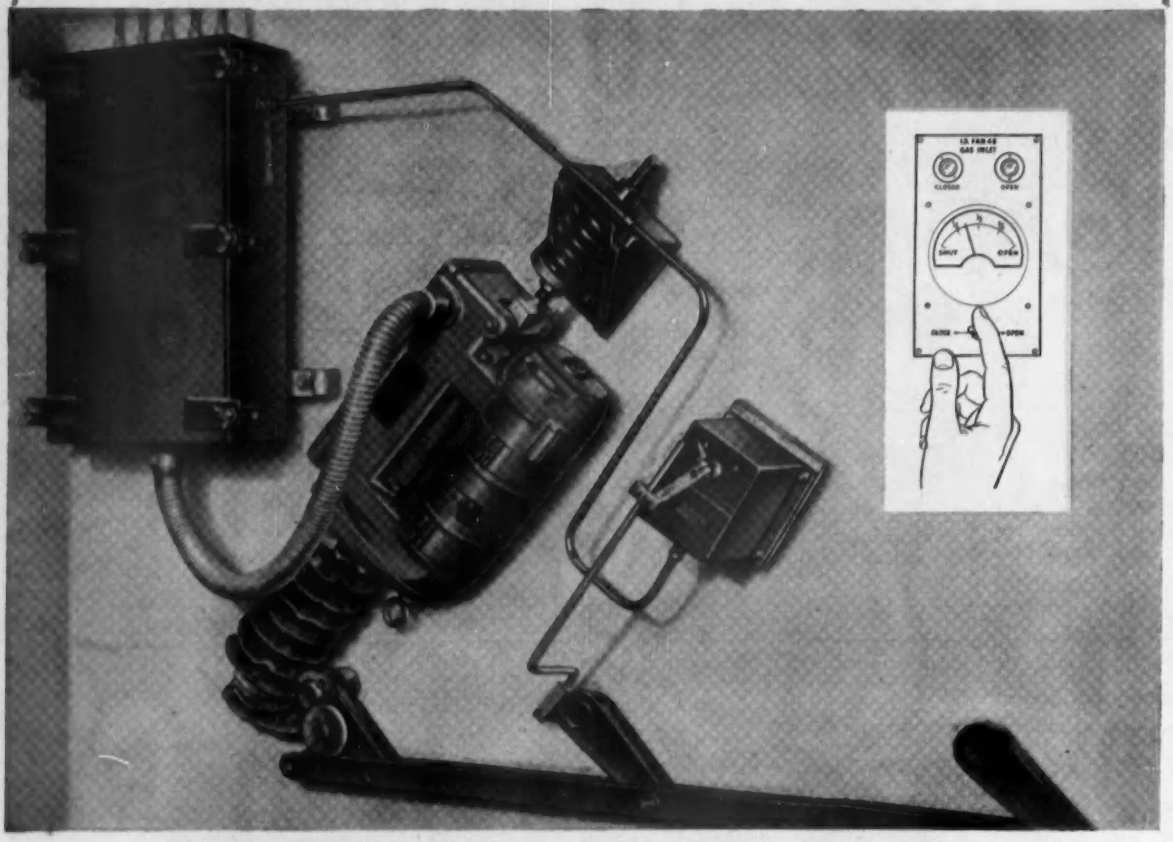
Fingertip damper control



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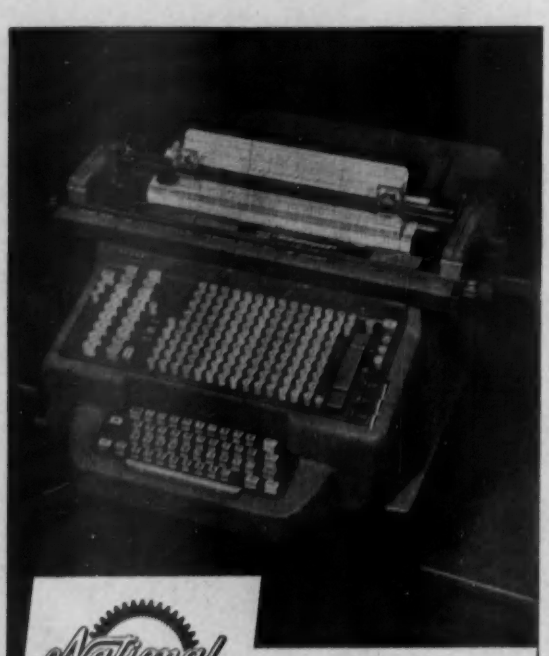

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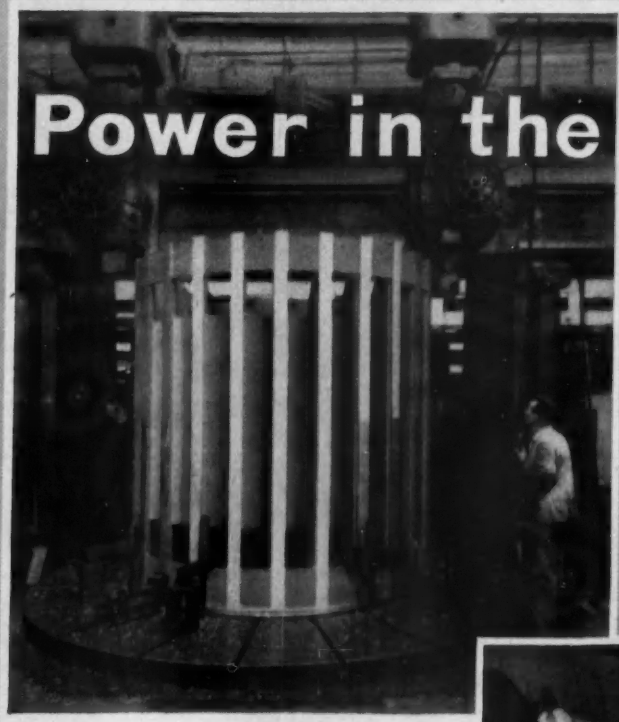
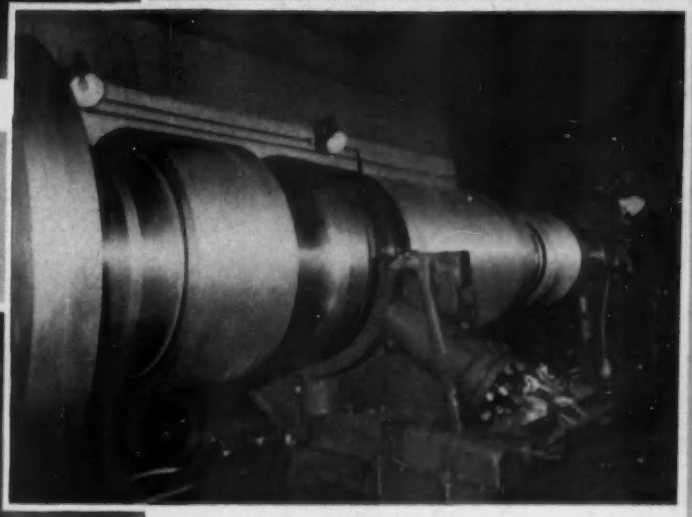


Machining the rotor spider.



Machining the rotor shaft. The completed rotor will weigh 300 tons.

The thrust block which will carry 360 tons dead weight, and 190 tons of water thrust.

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There's a warm welcome awaiting

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Standard voltage range 230/240. Other voltages available.
Designed to British Standard Specification 1670.

731 J Portable electric fire
An occasional fire that goes well with any décor. Highly-polished reflector gives very wide heat distribution. Pressed steel body, in golden russet finish with plated guard.

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1 kW element	£2.12.6
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253 J Portable electric fire
Simple and elegant in design, to go with any decoration scheme. Neat black feet and handle, heavily chromed reflector. Two 1 kW elements, protected by new and approved plated wire guard.
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252 J Panel electric fire
No need to cut away the wall. Chromium plated reflector in mushroom stove-enamelled panel. Two 1 kW elements, protected by new and approved plated wire guard.
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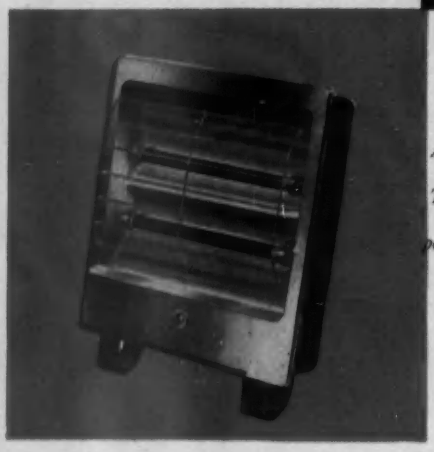

251 J Inset electric fire
All chromium plated, to blend with any type of surround. Two 1 kW elements, with one single-pole and one double-pole switch. New and approved design plated wire guard.
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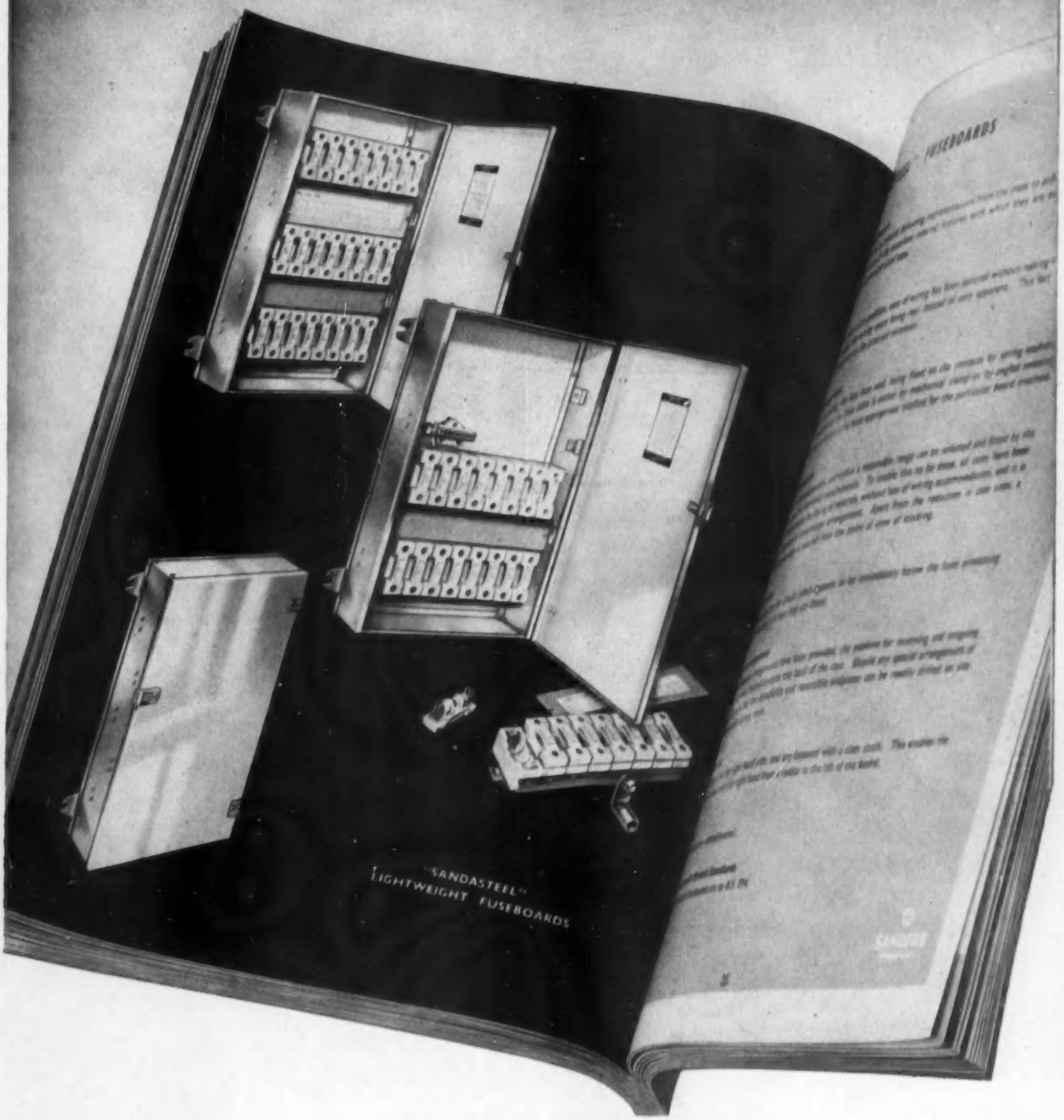

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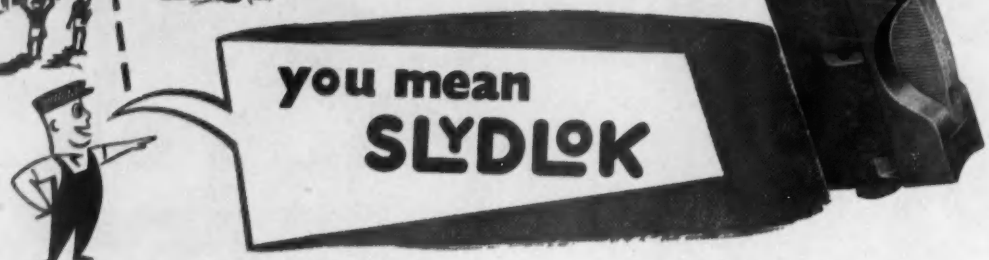

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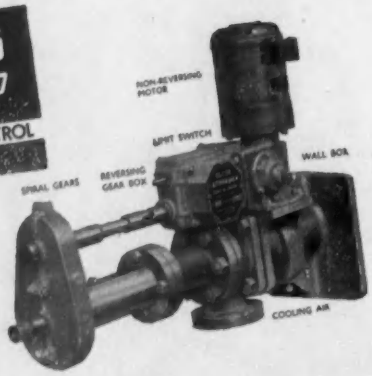

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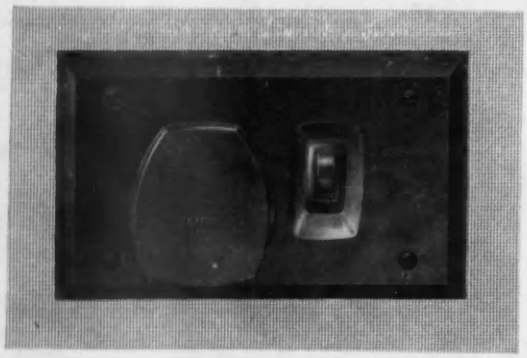

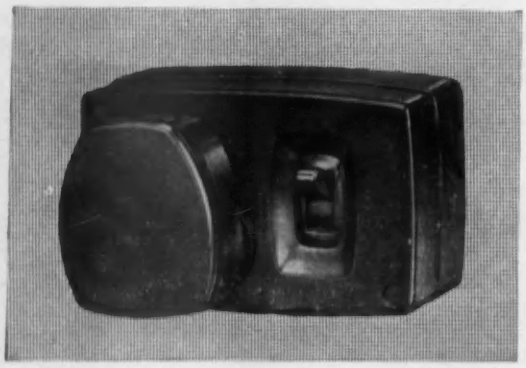

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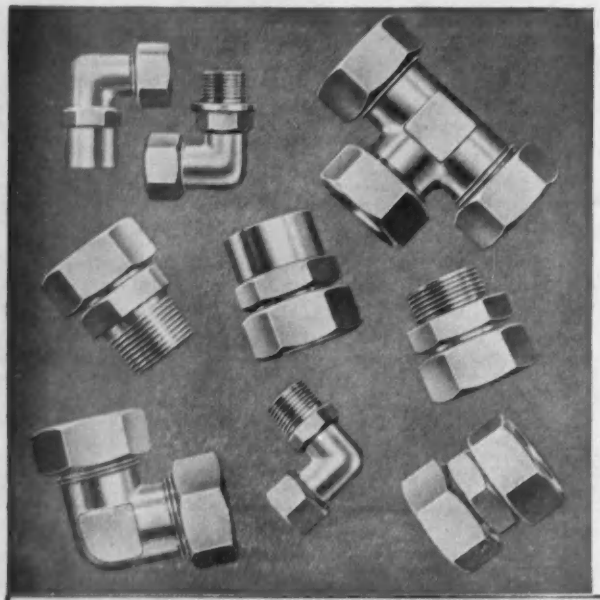

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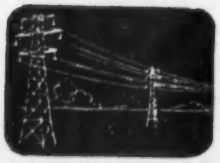

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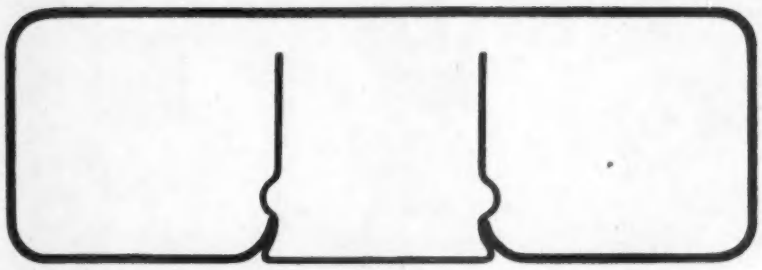

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Covered by Patent Applications Nos. 20825/54 30248/54

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Fig. 398 "ALL-IN-ONE" BELL
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Fig. 382 "TWO-IN-ONE" BELL
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Fig. 391 BAKELITE CASED BELL
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Fig. 1079 SURFACE DIS-CO-BELL
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Fig. 1132 TRANSFORMER
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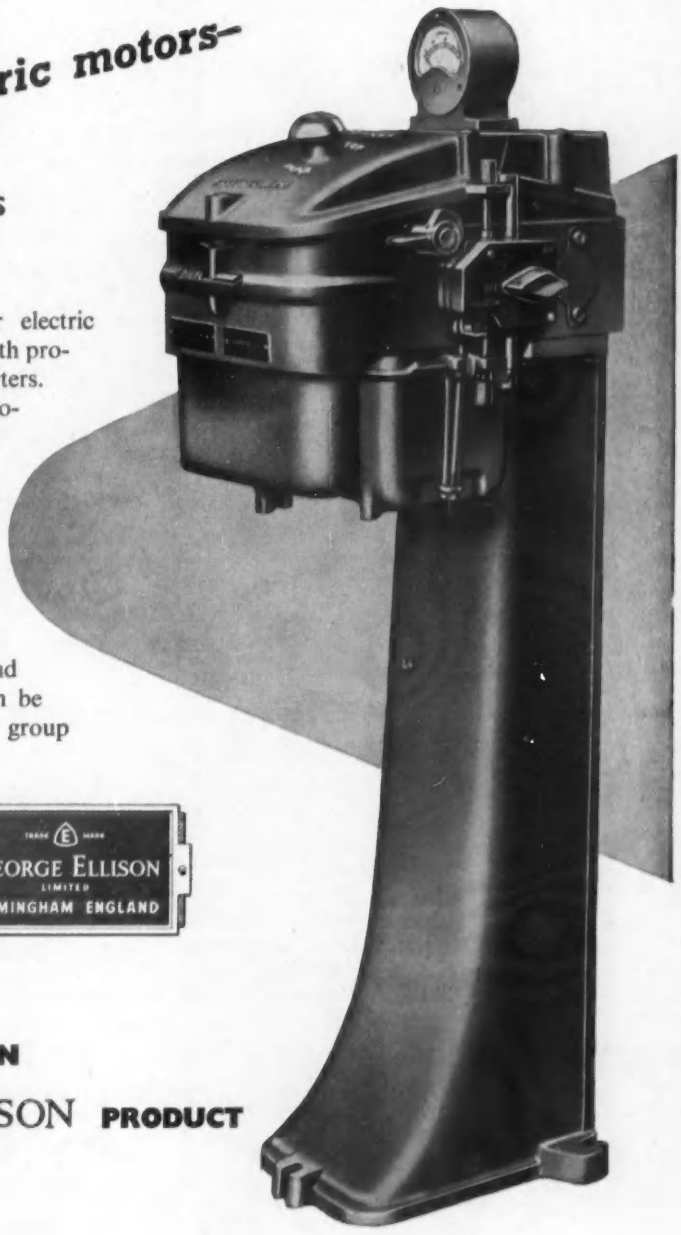

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ELECTRICAL TIMES

ESTABLISHED 1891

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D

INTERNATIONAL RESEARCH IN ACTION

Next month the Committee on Electric Power of the Economic Commission for Europe begins in Geneva a series of meetings of its subsidiary bodies which will culminate in a full session of the Committee at the beginning of December. We have commented before on the useful work being carried out quietly by this perhaps obscure though vital branch of the United Nations Organisation: the excitement of the major political meetings in New York overshadows too heavily the continued and valuable activities of these specialised agencies. Achievements of the Electric Power Committee have so far included an active part in the arranging of international power exchanges in Europe, with detailed clarification of the legal problems which so lessens the chance of disputes and friction in the future. At its next session the Committee will be considering as well the many technical activities sponsored by its sub-committees and working parties. These really are deserving of wider attention than they generally attract. In recent months the most active of the working parties has been that on rural electrification, and the list of reports in preparation by this body offers an imposing parade of international co-operation truly in action. The subjects range from mundane matters such as distribution pole life, through comparative studies of appropriate safety regulations, to such distant glimpses of the mechanised future as a study of "application of electric power to the transport and conveyance on farms in general and on stock-breeding farms in particular." That this last study is being co-ordinated by a Russian, and that further reports are the concern of other East Europeans is perhaps the final seal on this increasingly successful branch of the United Nations.

MECHANICAL A.C./D.C. CONVERSION

The chemical industry has always required large quantities of d.c. power for electrolytic and similar processes, and this demand shows no signs of slackening. Such power is generally derived from rectifiers and here recent development in the heavy power field has been rapid. As Mr L. Drucquer mentioned in his Chairman's Address to the Supply Section of the I.E.E., little change has occurred in the maximum rating of electrochemical rectifiers over the past 25-30 years —for the sake of convenience the maximum requirement remains at about 4,500 kW per rectifier bank or unit. The type of rectifier used has, however, undergone remarkable changes from the original rotary converter used for this class of work

to the modern pumpless sealed mercury-arc rectifier and the semi-conductor units including germanium types. A comparative newcomer is the large mechanical contact type. Developed originally in Germany, the latter has been under intensive development in this country within the past five years, and Mr Drucquer mentions that a 260 V unit having a rating of 3,900 kW and a current output of 15,000 amps has operated over considerable periods in commercial service. Although the theory of the contact rectifier has been known for many years, its translation into a practical proposition for a frequency of 50 c/s has been largely dependent on the development of suitable magnetic materials for the commutating reactors, which restrain the current to a low value during the instant of opening the contacts, and by the purely mechanical considerations of contact bounce, wear and synchronism. That these problems have been successfully overcome is shown by the recent information that a large chemical organisation has ordered no less than ten units similar to that mentioned by Mr Drucquer.

COAL OUTLOOK SETTLED

Coal stocks at power stations at the end of the prolonged cold of last winter were down to a little over 4¼ million tons, lower than a twelve-month before, and measured against the increasing electricity demand, were approaching a dangerously low level. It was apparent then that a major effort was needed if stocks were to be built up to a safe volume by the Autumn. Now November is nearly with us, and the task has been successfully carried out. Station stocks are a little under seven million tons, estimated as equivalent to six and a half winter weeks' supply for generating stations. This represents some excellent work by the N.C.B. and electricity officials concerned, but the achievement has not been inexpensive. From the end of March to the middle of October, 6·6 million tons of coal were imported into this country compared with 1·5 million tons in the same period of 1954. A large proportion of these imports have found their way to power stations, largely because these are conveniently situated for minimising transshipment, but also because of the technical ability of electricity industry staff to handle unfamiliar fuels. There is no extra direct cost to the industry in this; the N.C.B. has to sell the foreign coal at the appropriate price for the equivalent British fuel—but there is inevitably some loss of power station efficiency in using a coal other than that for which a station was designed. But these are minor disadvantages compared with the possibility that once seemed present, that there might be a danger of severe load cutting again for reasons of fuel shortage.

A LITTLE MORE GAS

Sales of gas to domestic consumers have been falling since the war, and this has been a matter of some concern to an industry which sells over half its product to this class of consumer. It is understandable, then, that the Gas Council in their annual report should take pleasure in announcing that the figures for 1954/55 at last show a rise. True, it is small by electrical standards, a mere 2·3%, but it does bring hope of a decline arrested. Even the more significant figure of therms sold per consumer shows a small increase, though the half per cent involved must surely be explainable by the cold weather which in the last year of account likewise benefited the electricity boards. The Gas Council thinks otherwise. It believes that a greater proportion of new gas appliances is coming into use, and that the peak of the effect of such appliances replacing older and less efficient designs, and so cutting down gas consumption, is passing. Whatever the justification of this rosy view of a small increase in sales per consumer, the opinion about new appliances having overtaken post-war obsolescence certainly needs to be taken seriously by the electrical industry. If the replacement market which has been so sure a source of sales is now drying up, the energetic gas industry can be relied upon to increase still further its efforts to win over new recruits to gas appliances. The electricity industry, to keep its own domestic expansion at its present satisfactory rate, will have to watch carefully any moves in this direction in the difficult months that lie ahead.

CONFER OR ENTERTAIN?

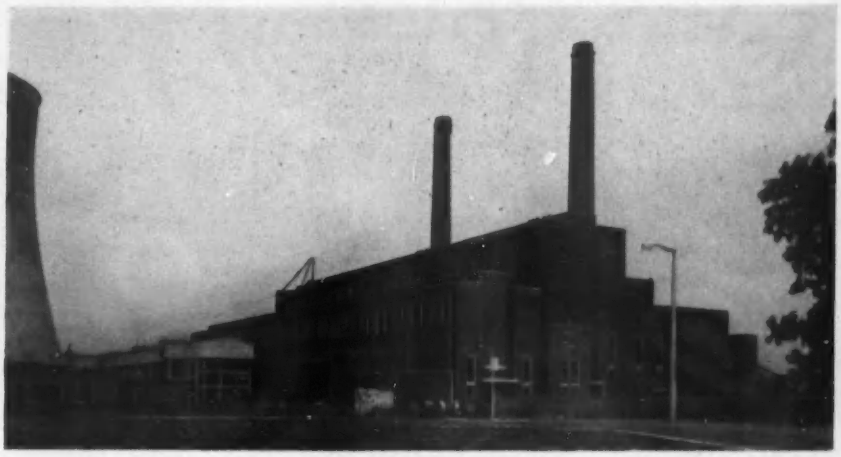
Doctors are proverbially unready to take their own medicine, and so it is perhaps not surprising that there has previously been no regular conference of conference organisers. Largely as the result of the initiative of Mr J. W. Simpson, Secretary of the British Electrical Power Convention, such a conference was held last weekend. Harrogate, that conference town *par excellence*, was presented with the plaints of those who every summer try to keep several hundred holiday-minded delegates close to a packed business agenda. Mr Simpson in the paper he read to the conference drew largely on his experience with the electrical industry, and not surprisingly, much of what he said is of direct interest. Foremost looms the problem of hotels, which is particularly pressing with large conferences such as the B.E.P.C. Mr Simpson condemned the block booking of accommodation by persons "outside" the conference, sometimes by as much as two years ahead, and pleaded that these offenders should co-operate with the organisers. The degree to which this co-operation can be expected is, however, debatable.

SITES FOR NUCLEAR POWER

Last week's announcement that sites have at last been selected for the first two nuclear power stations added little to that bare fact. Some of the background to the considerations necessary in searching for suitable sites were suggested succinctly by Lord Citrine in an address delivered yesterday in New York. He dispelled any idea that isolation was the only important consideration with a reminder that for nuclear reactors of the present British design, employing a massive graphite core and surrounding concrete shielding, the foundation requirements are appreciably more severe than in a conventional power station. Water is a still more difficult problem; megawatt for megawatt, nearly twice as much water is required in a nuclear station as in a coal fired design. Finally—and this is a point too easily overlooked—it is desirable that sites suitable for conventional power stations, already at a premium, should not be absorbed for nuclear stations while these are still essentially supplementary in the nation's power programme.

Meteor

This C.E.A. engineered station operates at the advanced conditions of 1,500 lb/sq in. 1,050° F. The "B" station on an adjoining site will contain four 120 MW sets operating on a reheat steam cycle with initial conditions of 1,500 lb/sq in. and a temperature of 1,000° F



Drakelow "A" opened by Mr J. Eccles

IN February 1952 we gave a brief description of the plant to be installed at Drakelow "A" power station. Located near Burton-on-Trent, this site possesses the twin assets of closeness to its coal supply and a heavy industrial loading within a comparatively small radius. The station has, in addition, the use of the River Trent as a partial source of cooling water, although this is not sufficient to provide full cooling under normal conditions and cooling towers are needed in addition.

The history of the station is comparatively long. It was first envisaged by the City of Birmingham Corporation Electricity Department, and permission to proceed had been obtained from the then Central Electricity Board. When nationalisation took place in 1947 plans for the station were already well advanced and were taken over by the Generation Construction Department of the Midlands Division, who assumed the responsibility for their implementation, although the station itself lies in the area of the East Midlands Division of the Authority.

Initial site clearance for the first section of the new station was begun in May 1950, and despite the difficulties and delays with supplies of materials which occurred in the ensuing period, the first set was commissioned in December 1954. By the end of this year all four sets should be in operation.

Station Arrangement

The station is designed for a total installed capacity of 240 MW comprising four 60 MW sets operating under the stop-valve steam conditions of 1,500 lb/sq in., and 1,050° F. The sets are arranged longitudinally along the length of the turbine room, with the two pairs of steam ends facing each other. Each set has its own boiler with an evaporating capacity of 515 klb/hr; conditions at the superheater outlet are 1,550 lb/sq in., and 1,060° F. There is no dividing wall between the boiler house and the turbine room. On the other side of the turbine house, away from the boiler house are the bays accommodating the circulating water pumps, and, at operating floor level are the annexes housing the switchgear for the turbine room auxiliaries. The turbine room operating floor, standing some 20 ft above the basement level—which is in this station the same as the ground level—is carried the full length of the sets with extensions on one side to provide accommodation for the turbine gauge boards and, on the other side, to give access to the boiler house. The heater bay, which accommodates the feed heating plant and the feed pumps is located between the turbines and the boilers.

Alongside the "A" station, work is proceeding on the construction of Drakelow "B." This station building will be larger than the "A" station, but is designed to harmonise with the "A" station in its layout, cladding and other architectural features. The plant to be installed will comprise four 120 MW sets operating with steam conditions of 1,500 lb/sq in. and 1,000° F. The unit boilers will have an output of 860 klb/hr each and will be arranged for reheating from 700° F to 1,000° F at 415/375 lb/sq in. This station will feed in to the 275 kV supergrid, on which Drakelow is a key point.

Building Structure

The main building housing the generating plant is of brick panelled construction. The boiler house is steel framed and the turbine room has a framework of reinforced concrete. Overall dimensions are 575 ft in length, and 340 ft wide, the boiler house parapet being 138 ft above ground level.

Civil engineering work was to a certain extent simplified by the presence in the subsoil of marl which permitted the adoption of solid foundations. The site is somewhat below the level of the main railway lines and it was found convenient to utilise the spoil from the foundation excavations for the embankments required for the station railway sidings which are extensive, in view of the ultimate capacity to be supported by the site. Special mobile plant was used to transport the large quantity of material involved and at the peak some 300,000 cubic yards were handled in 8 weeks.

The station buildings were designed by Mr J. H. Somerset, A.R.I.B.A., who gave particular attention to details

of the external appearance in order to present a dignified exterior in keeping with the functional character of the station without resorting to expensive and lavish ornamentation. The two brick chimneys, each 360 ft high, take off from a level well below the boiler house roof, but above ground level, and provide a well-balanced appearance. The use of a horizontal coal conveyor system at comparatively low level into the power station, avoids the general break-up of the horizontal and vertical lines inevitable with sloping conveyor systems.

Control room, station administrative offices and first-aid centre are grouped in a building situated at the end of the "A" station, but which will be in the centre of the main building group when the "B" station is built.

Coal Handling

Facilities are installed for receiving both rail and road borne coal. The handling plant comprises two sets of duplicate wagon tipplers, one for each pair of boilers, together with gravity bucket conveyors and belt conveyors discharging to the coal bunkers or to the storage area as required. The plant is designed to handle standard wagons up to 24 tons capacity and each of the tipplers and their associated conveyors can operate at a rate of up to 120 tons/hr.

Provision has also been made for handling 40 ton side or bottom discharge hopper wagons by the construction of an underground receiving hopper into which road vehicles can also discharge. Coal from this hopper can be transferred mechanically to belt conveyors interconnected with the rest of the system. The main coal store is equipped with a transporter bridge capable of storing and reclaiming at rates up to 240 tons per hr.

Ash from boiler hoppers and dust from the precipitators are conveyed to the disposal grounds by water sluice. Two 100% duty, 3,300 galls/min electrically-driven horizontal spindle sluice pumps draw water from the c.w. culverts and discharge it to the ash and dust sluices. In the boiler house, these sluices are below ground level and are arranged to give a gravity flow from each end toward the centre of the boiler house and thence to two swirl pits situated outside the main building adjacent to the ash pump house. Three 100% duty 3,300 galls/min vertical spindle ash pumps in the ash pump house raise the ash and dust-bearing water from these pits and discharge it by means of a gravity-fall overhead launder to the ash disposal ground located in a loop of the River Trent about half a mile distant.

Boilers

There are at present the full complement of the "A" station boilers consisting of four units, each with an evaporation of 515 klb/hr at 1,550 lb/sq in., 1,060° F. The injection temperature of the feed water is 430° F. Each unit comprises a radiant-type furnace, superheater, economiser, air heater, forced and induced draught fans, together with fuel pulverising plant and oil lighting-up equipment. Tilting burners are used for control of the final steam temperature, with further regulation being provided by primary superheater by-pass dampers. The steam temperature can be held within ±10° F over the range of 80 to 100% full load.

Each boiler has four pulverised mills and four exhauster fans. Other auxiliaries include two induced-draught fans with variable speed motors, and two forced-draught fans with similar drives. Two air heaters of the rotary regenerative type are also provided for each of the boiler units.

The turbine room interior. No. 1, 2 and 3 machines are now running. The fourth unit is still being erected

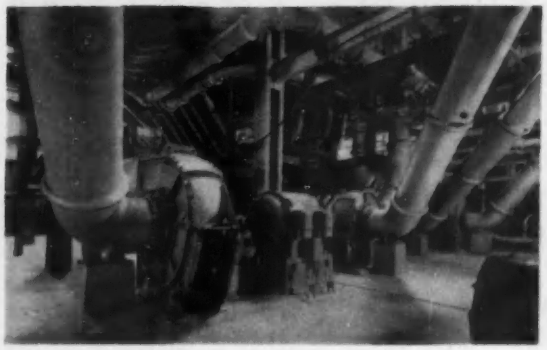
Generating Plant

The turbines are designed with three cylinders in tandem, the first consisting of a short sturdy h.p. cylinder, with an i.p. and a double-flow l.p. cylinder following. Two separate steam chests are used for each machine, the usual oil servo mechanism being used to control the valve positions. Six bleed points are provided for feed heating purposes, the final feed temperature being some 430° F.

The l.p. cylinder has twin exhausts connected to twin condensers. The total cooling surface area is 55,000 sq ft and requires 32,600 galls/min of circulating water arranged to flow in two passes. Three 50% duty two-stage steam-jet-operated air ejectors are installed, and extraction is by two 100% duty condensate pumps. Each set has three 50% duty two-speed circulating water pumps. All these are of the vertical spindle type and are driven by 3·3 kV squirrel cage induction motors, the rating being 155 b.h.p. for the extraction pumps and 455/195 b.h.p. for the circulating water pumps.

There are two 100% duty feed pumps for each unit driven by constant-speed motors, and each is capable of discharging 515 klb/hr through the four high-pressure heaters at a pump discharge pressure of 2,120 lb/sq in.

The control room is pictured on the right. This is designed to accommodate the complete equipment for both "A" and "B" stations



The boiler house basement is actually located at ground level. Some of the fans and ducting are shown here

The alternators generate at 11·8 kV and are rated at 60 MW, at 0·8 power factor when operating at a hydrogen pressure of 0·5 lb/sq in. above atmosphere. The hydrogen equipment located in the basement, maintains the pressure and density of the cooling medium within the machine to close limits.

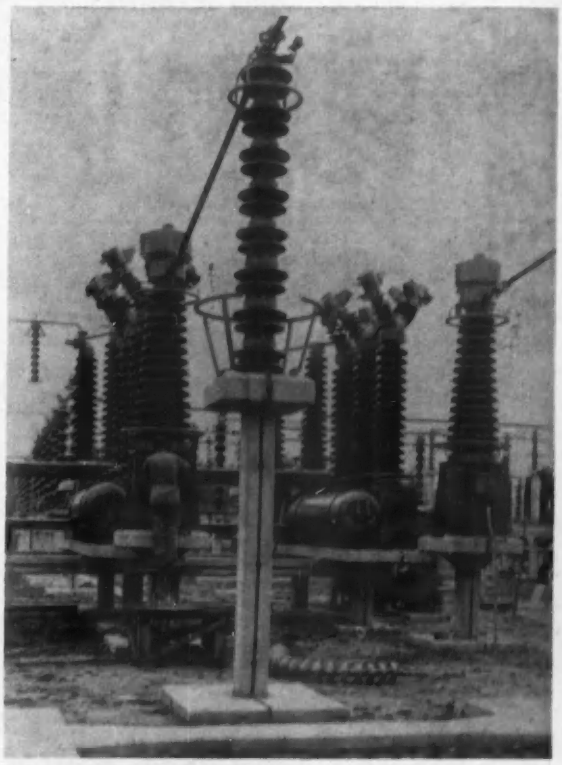
Auxiliary Plant

Separate motor-driven exciters are provided to supply the field system of the alternators and operate in conjunction with normally inactive automatic voltage regulators. Protection against under excitation is provided by a low-excitation limiting device which is brought into operation when a predetermined stability margin is approached. A standby exciter set is also installed, and is additionally arranged to provide current for the quick charging of the two 800 Ah lead-acid station batteries. These normally float across the d.c. busbars and are automatically charged by two 20 kW mercury arc rectifiers.

In accordance with modern requirements for rapid starting, supervisory equipment has been fitted to each turbine and alternator to provide an indication and record of shaft position, eccentricity, vibration, pedestal expansion, speed and throttle valve positions. Any divergencies from the desired conditions are thus detectable and remedial measures can be taken. The instruments are mounted on a panel near to the steam end of the machine so that the turbine driver can take immediate action.

A total of 700 motors will be installed in the complete station and will have an aggregate horse-power of over 43,000, and range in size from 2,070 h.p. for the boiler feed pumps to f.h.p. motors associated with the control functions. Above 120 h.p. the motors are switched at 3·3 kV direct, and the smaller machines are controlled by air-insulated contactor gear mounted adjacent to the appropriate auxiliaries. Essential standby motors for the turbine oil and hydrogen systems operate from the main station batteries.

All the turbine auxiliary motors are of the squirrel cage type, started direct on line. Speed regulation on the boiler fan and fuel group drives is provided by the use of commutator motors fitted with induction regulators. Motor control generally is grouped into operational functions and is carried out from the turbine or boiler control panel, or from local control panels for such important auxiliary services as circulating water.



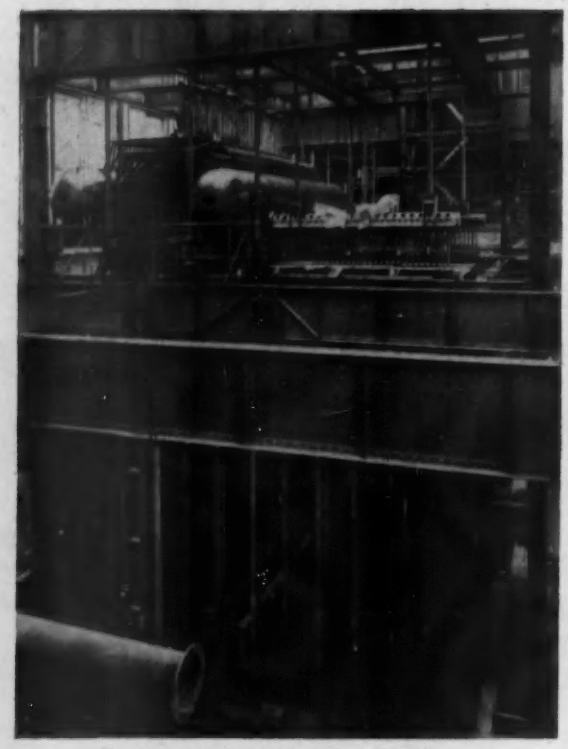
In the switching compound 275 kV air-blast breakers are under erection. The "B" station generators will be switched and synchronised at this voltage

The river water pump house with the station in the background

The instrument and control panels for turbines and boilers are located on the main operating floor and are of the cubicle-desk type, accommodating in addition to the instruments necessary for the operation of the units, control switches for auxiliary and standby motors, indicating lamps and alarms. A comprehensive telegraph and telecommunication system maintains communication between the plant and control room operators.

Electrical Equipment

Auxiliary supplies are derived from 6 MVA unit transformers connected direct to the alternator terminals and an alternative supply can be obtained from the 10 MVA station transformers. About 5·8% of the total generated energy of the completed station will be used for powering auxiliary equipment.



The boiler under construction showing top drums

The lower voltage switchgear is single busbar truck, air-insulated, solenoid-operated, having a rating of 150 MVA at 3·3 kV and 25 MVA at 415 V. The 3·3 kV system is resistance earthed and the 415 V system is solidly earthed. Six auxiliary switch houses are provided for the gear associated with the turbo-alternators, boilers, ash and coal plant and river water plant.

The alternators are connected through 72 MVA —8/141·6 kV transformers to the 132 kV switchgear. This latter comprises fifteen bays of airblast gear of 3,500 MVA rating. The isolators are manually operated with the exception of those associated with the busbar sections which are motorised. The first section of the 275 kV, 7,500 MVA air-blast switchgear associated with the Supergrid and the development of the "B" station is now in progress.

Opening Ceremony

Speaking at the opening ceremony, Mr J. Eccles, deputy-chairman (operations) of the C.E.A. referred to the pioneer design of the Drakelow plant. The latest venture, however, was the ordering of three 200 MW sets.

These units would operate with steam at a pressure of 2,350 lb/sq in. and a temperature of 1050° F. As far as he was aware, there were no other sets of comparable size which would operate under those onerous conditions. Before the end of this year it was hoped to have a 100 MW set running, and 120 MW units were under construction.

As far as nuclear energy was concerned, it was hoped to start work on the new selected sites early in 1957.

Sir George Nelson spoke on behalf of the Contractors, replying to Mr F. W. Lawton, formerly Divisional Controller, while Mr F. Favell, Chief Generation Engineer (Construction) of the East Midlands Division introduced the speaker.

Principal Contractors

Civil engineering works	Sir Robert McAlpine and Sons (Midlands) Ltd.
Structural steelwork	John Lysaght (Bristol Works) Ltd.
Cooling tower	Mitchell Construction Co.
Turbo-alternators and condensing plant	The English Electric Co., Ltd.
H.P. and C.W. piping	Alton and Co., Ltd.
Valves	Hopkinson Ltd.
	J. Blakeborough and Sons Ltd.
Boiler plant	International Combustion Ltd.
Superheaters	The Superheater Co.
Economisers	Senior Economisers Ltd.
Air heaters	James Howden and Co., Ltd.
Boiler and furnace tubes	Stewarts and Lloyds Ltd.
Electrostatic precipitators	Sturtevant Engineering Co.
High-tension equipment	British Thomson-Houston Co., Ltd.
Coal-handling plant	Mitchell Engineering Ltd.
Ash-handling plant	International Combustion Ltd.
Water pumps	Drysdale and Co., Ltd.
Water-softening plant	John Thompson-Kennicott Ltd.
Pumps for water-softening plant	Mather and Platt Ltd.
Fire protection installation	Mather and Platt Ltd.
Generator and auxiliary transformers	The English Electric Co.
Station transformers	British Elec. Transformer Co.
275 kV, 132 kV, 3·3 kV and 415 V switchgear	A. Reyrolle and Co.
Motors	Laurence Scott and Electromotors Ltd.
Switchgear for motors	The English Electric Co., Ltd. Laurence Scott and Electromotors Ltd. Contactor Switchgear Ltd., Brookhirst Switchgear Ltd.
Cables	British Insulated Callender's Cables
Telephones	Automatic Telephone and Electric Co.
Lighting and heating	Central Electricity Authority (direct labour) Holophane Ltd. British Thomson-Houston Co., Ltd. Benjamin Electric Ltd. General Electric Co., Ltd.
Batteries	Artic Fuse and Electric Mfg. Co.
	Tudor Accumulator Co., Ltd.
Consulting civil engineers	L. G. Mouchel and Partners Ltd.

HEAT PUMPS in the HOME

Installation and operating experience of the "Fridge-heater" described by BASIL de FERRANTI B.A., Grad.I.E.E.

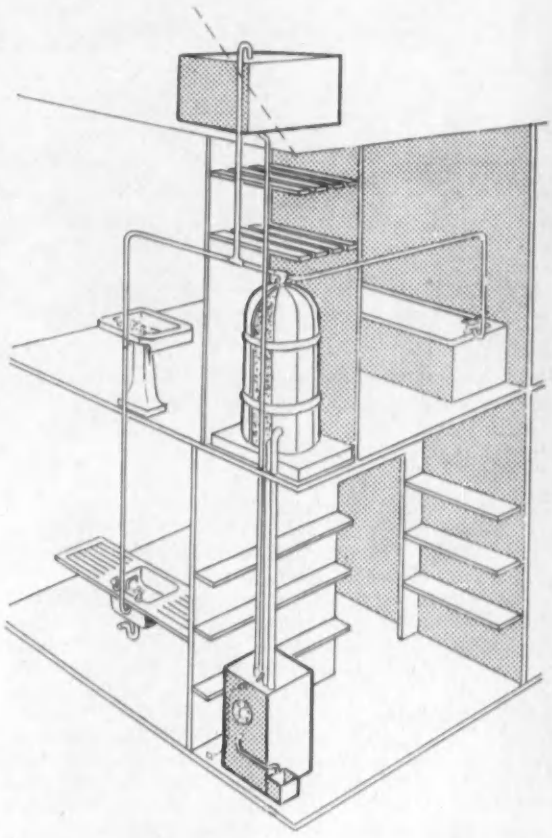
THE Ferranti "Fridge-Heater" is a heat pump designed to perform the dual task of water heating and larder cooling. The purpose of this article is to explain the installation requirements and to give some idea of the results being achieved. The machine (Fig 2) is very compact, taking up the minimum possible amount of space in the larder. It will effectively cool larders of sizes up to and including 15 sq ft floor area and, providing the larder is of normal brick construction, no additional insulation is required. A ventilation brick near the ceiling or a small window is desirable and the larder door should preferably be of the flush panel type and be well fitting. Any larder coming within these recommendations is suitable for the installation of the "Fridge-Heater."

The three connections for the flow and return pipes to the storage tank and the cold water feed pipe from the header tank are clearly indicated on Fig. 2 and the machine is connected up as shown in Fig. 1. Notice that the cold water feed is taken direct from the header tank to the machine and not via the hot water storage tank. This eliminates intermixing of the hot water in the storage tank and the cold make-up water when small draw-offs are made and it also cools the condenser tank and "trips" the thermostat.

The flow and return pipes together should not total more than 40 ft in length; the storage tank, therefore, should not be more than 20 ft from the machine measured along the circulating pipe track. These pipes must, of course, be well lagged along their entire length in order that heat losses from them are kept to a minimum.

Because of the slower rate of heating up inherent in an appliance of this nature, a 30 gallons hot water storage tank is recommended and in normal domestic applications this will prove adequate for any peak demands which are likely to occur. The amount of lagging on this tank is arranged to give a suitable heat-leak which enables the machine to run intermittently even though no hot water is being used; thus the larder is maintained at an even temperature without the machine having to run unnecessarily with consequent increased running costs. The amount of lagging required is determined by the use of a standard calculation based on normal thermal practice. By using the storage tank to provide a heat leak in this way a self-regulating effect is achieved. When the tank is full of hot water the losses from the system are at a maximum. However, as soon as a withdrawal is made and cold water enters the system the losses are reduced. The heat lost from the storage tank is usefully employed to provide airing cupboard facilities.

The "Fridge-Heater" can be used in conjunction with an immersion heater in cases where there is an excessive hot water demand. The immersion heater should be arranged to heat the top third of the tank and the thermostat set at 140° F to correspond to the output temperature from



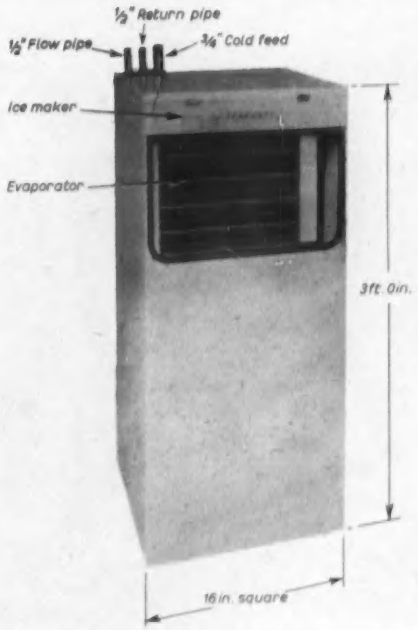


Fig. 1 (top right), simplicity of connection is clearly indicated in this diagrammatic representation of a typical domestic installation, whilst Fig. 2 (on the right), the dimensioned illustration of the "Fridge-Heater" demonstrates the compactness of the machine

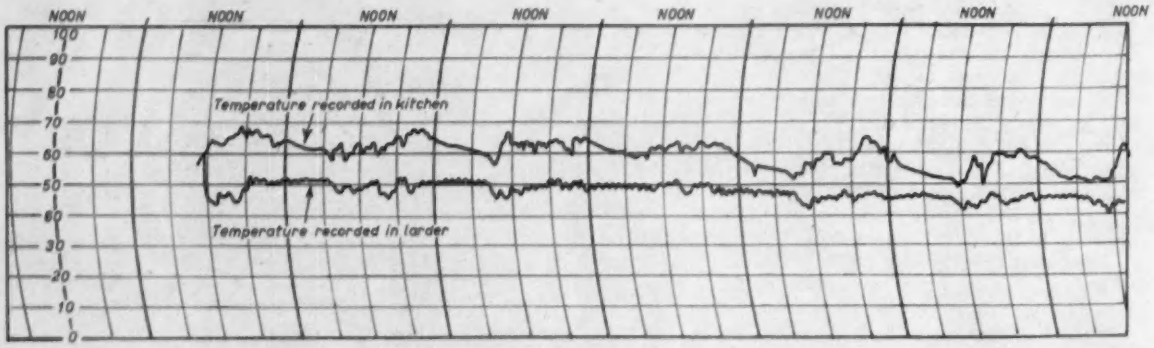


Fig. 3. Temperatures experienced in the day-to-day running of a "Fridge-Heater". The larder temperature is barely influenced by external variations and is always below kitchen temperature

the "Fridge-Heater" which heats the lower portion. In this way the immersion heater will only come into operation when excessive demands are made upon the hot water system and is very economical to run. It is obvious then that the installation of a heat pump is in the majority of cases a straightforward matter and no exceptional demands are made on the purchaser.

The machine is capable of providing between 60 and 100 gallons of hot water per day at 140° F, the variation being due to the varying ambient temperatures throughout the year. It should, however, be mentioned in passing that the output only drops to the lower figure during very wintry conditions. The temperature of 140° F has been found to be completely satisfactory for all household tasks. The machine is not suitable for central heating applications.

In the larder, the "Fridge-Heater" maintains a temperature difference in the lower portion of 15° F below the mean ambient temperature and the accompanying thermographs (Fig. 3) show the temperatures recorded in a larder and kitchen respectively. As the larder air is circulated through the machine and cooled the moisture present condenses out bringing with it the dirt and dust present in the air. The action of the machine, therefore, is not only to cool the air but to dry, cleanse and circulate it thus promoting ideal food storage conditions.

The graph (Fig. 4) indicate very clearly the cost of obtaining hot water and refrigeration by the "Fridge-Heater" and also by the more conventional immersion heater plus refrigerator. As an example, consider a daily

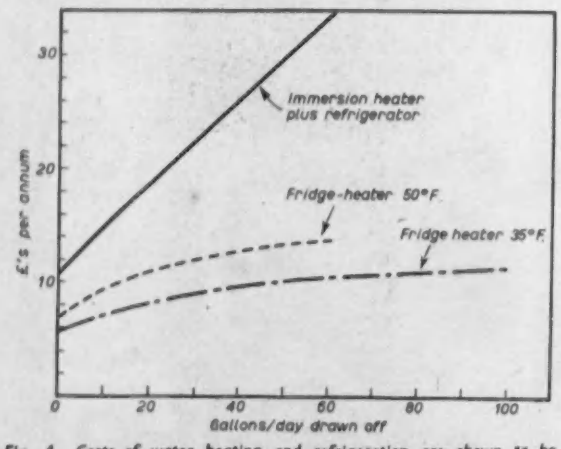


Fig. 4. Costs of water heating and refrigeration are shown to be much less with the "Fridge-Heater" than with a separate immersion heater and refrigerator. Running costs of a "Fridge-Heater" operating at 35° F and 50° F are also compared

consumption of 40 gallons of hot water—the running cost of a "Fridge-Heater" installation is £9. 6s. per annum whilst the cost of the more conventional system is £26. 2s. p.a.

The "Fridge-Heater" allows a considerable saving to be made in the home and nationally it has been estimated that for each heat pump of this type installed in this country a saving of more than one ton of high grade fuel is achieved per year. This represents a substantial saving and could do much to ease our present fuel problems.

Progress in the Gas Industry

FOR the Electrical Engineer, the 6th Report of the Gas Council has its greatest attraction in the technical progress being made by that industry in improving its efficiency in the use of coal and of the development of other sources of gas. That the Gas Council is achieving greater efficiency is shown by the amount of gas made from a ton of coal. In 1952/53 the total amounted to 74 therms, in the year under review (1954/55) the total had risen to 74·8 therms.

Like the Electricity Supply Industry, the Gas Industry is turning to oil to supply some of its end products, and four Boards are producing gas in this way. Particular attention is being given to the Segas and Onia-Gegi processes, although other processes are being tried, and the Gas Council suggests that all Boards should erect one plant of each of these two types. Moreover, discussions were being undertaken at the end of the year for the supply of "tail" gases from oil refineries. The search for natural gas has also continued, and at the present the most promising results appear to have been obtained from drillings in the Ashdown Forest area of Sussex. If natural gas is found in commercial quantities, its most economic distribution will pose a number of technical questions, to whose solution studies have already been made of the practices in the United States and Northern Italy. A further consideration is the liquefaction of natural gas, reducing its volume by 600 times, which can be effected by reducing its temperature. This method opens the possibility of transporting the gas in this form from Middle East oilfields.

Another question receiving attention is the use of methane from coal mines, and a joint N.C.B. and Gas Council Committee appointed to study this possibility, reported that interruptions or changes in the rate of supply of methane for town gas might necessitate the maintenance of standby plant or the provision of facilities for liquefaction and storage. In commenting on the Beaver Committee's Report, the Gas Council are now planning to increase domestic supplies of coke; at present, the problem of meeting the peak winter demand is becoming increasingly difficult.

Testing Industrial Switchgear

SHORT-CIRCUIT EQUIPMENT IN NEW SCOTTISH LABORATORY

READY access to short-circuit testing plant is of the greatest value in developing switch and control gear for industrial equipment. It is thus appropriate that a short-circuit testing alternator should be the principal unit in new laboratories of the Belmos Company, which are situated at the company's Blantyre factory.

The short-circuit plant is designed for the requirements of lower voltage types of switchgear, especially contactor gear. The alternator is an eight-pole machine of 625 kVA normal rating, and for test purposes it is driven through gearing and a vee-belt from a 1,500 r.p.m. induction motor. According to the short-circuit current required, the alternator can be connected in star or delta, 440 V being obtained with either connection. There is provision for field forcing to offset the demagnetising effects of heavy stator currents. Peak available short-circuit current is about 12,000 amps. For emergency shut down of the set, a battery-operated dynamic braking system is provided which can bring the set to rest within 1½ minutes, compared with the 7½ minutes usually required.

An air breaker rated at 25 MVA is installed as back-up protection for the test set. A heavy-duty isolator is used as the make switch, a spring-closing system being provided for this. Arrangements are made for closing the switch at any preselected point on the voltage wave. There is an auto-transformer for use when tests have to be carried out at voltages other than those obtainable directly with the alternator.

Power factor selection for tests depends on the use of air-cored reactors. Six separate coils are provided, and a link board gives facilities for any form of interconnection. The resultant range of reactance available is from one-third to 12 times the reactance of a single coil. Resistor banks are provided with similar link arrangements.

Instruments provided for use with the test station include a 12 element Duddell oscilloscope. Control of the sequence of operations during a test is provided by a cam controller having 20 channels.

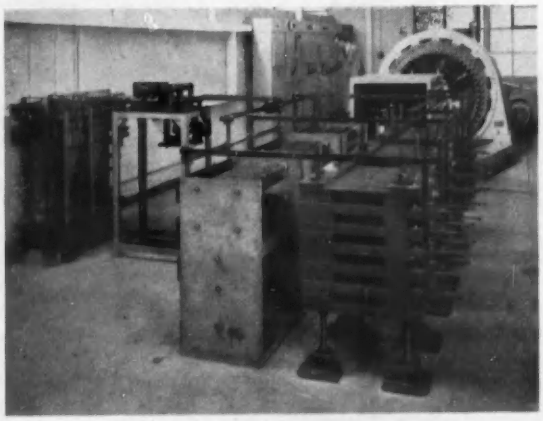
A series of open-fronted test cells are provided in the laboratory, and the control desk and measuring equipment is placed facing them and at a safe distance away.

Besides the short-circuit equipment, the laboratory is equipped with machines for providing variable frequency supplies, d.c. tests, and heavy current supplies for temperature runs. A.C. supplies up to 50 kV r.m.s. are available for insulation testing. Additionally, there is a good range of laboratory measuring equipment, as the accompanying illustration suggests.

Opening Ceremony

The laboratories were opened officially on Monday, the ceremony being performed by Dr S. Whitehead, Director of the E.R.A. In his remarks, Dr Whitehead expressed his belief in the importance of small industrial concerns operating research and development laboratories. The existence of research associations and the larger laboratories in no way meant that the smaller organisations were superfluous.

Amongst other speakers was Mr T. Coughtrie, chairman and managing director of the company. He spoke of his pride in being the leader of a team of young men who had turned the possibility of the laboratory into reality.



Above. Short-circuit test plant showing alternator and main circuit components for control of currents up to 12,000 amps

Right. The new research laboratory at Blantyre factory. A laboratory equipped for investigation and type testing on prototype gear

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

I.E.E. Statutory Regulations

LEST the passing of time should obscure the circumstances surrounding the introduction of the 13th Edition of the I.E.E. Regulations, may I comment on the letter from A. Dearden in your 13th October issue. First, the I.E.E. Regulations are not Statutory Regulations and cannot (by themselves) be used to enforce anything. The method of presentation of the Regulations is purely to enable the regulations in Part I to be read easily in conjunction with the Electricity Supply Regulations 1937. The 13th Edition *does not* give the Electricity Supply Authority any more power as Mr Dearden suggests in his letter.

We all know how much we would like to see all installations complying fully with the I.E.E. Regulations, but the Statutory Regulations definitely do not state that all installations must comply with the I.E.E. Regulations, but that if the installation does comply with the I.E.E. Regulations it automatically complies with the Supply Regulations—clause 27 (iii) refers. Therein lies the subtle difference. The mere disconnection of a supply to an installation does not give the Supply Authority the right to have that installation altered to comply with the I.E.E. Regulations, however much they, or the electrical contractor, would wish it to be so.

If the consumer disputes the Supply Authority and the matter is referred to the Minister of Fuel and Power (who has inherited the authority from the pre-vesting day Electricity Commissioners), the consumer can be assured that the Statutory Regulations will be the ones governing the matter.

It will be known only too well by any engineer who has been called as technical witness in a dispute brought before the Courts, how a Counsel can bring quite a different legal interpretation to a Statutory Regulation, than that which would be obvious to an engineer.

R. W. Marsh,
ENGINEERING DIVISION, B.B.C.

Thermal Storage Heating

ALTHOUGH I cannot fully subscribe to all the views expressed by Mr F. D. Parker in his recent article on the "Control of Thermal Storage Heating," I feel he is to be congratulated on his constructive approach to the problems arising in the development of a heating system in which considerable interest is being taken at the present time.

It is, of course, unquestionably possible to devise a control system for this type of heating which, even with the vagaries of the British climate, would provide conditions as near as possible to the ideal. It cannot be over-emphasised, however, that any such control system must be designed primarily to be simple for the layman to operate and understand, and that its cost should be the minimum required to provide conditions not inferior to those obtained by any competitive heating system.

We still cannot overlook the fact that in spite of its many advantages electric off-peak space heating has to face severe competition from other fuel systems.

A great deal of pioneer work has been carried out over the past few years, both in this country and in Southern Ireland, and systems such as Mr Parker refers to have all been tried and, for one reason or another, found wanting.

There exist cases which, because of special problems, needed individual treatment; but it has been established that the provision of individual inside thermostats, each controlling a group of heaters, leads, in general, to the most satisfactory and economical operation with the minimum capital expenditure.

In my opinion, the weakness referred to by Mr Parker of a falling temperature towards the latter part of the day, and the frankly not too satisfactory thermograph charts which he produced, are due to the use of one thermostat to control the whole of the space. No account is taken of the varying heat losses in different sections, so that the charge taken by all the heaters is governed by the position of one thermostat which may result in over-charging or under-charging, according to its position.

In designing a block storage installation, Mr Parker suggests that approximately 33⅓% should be added to the calculated kW load to allow for the hours the supply is not available. I suggest that this figure is too high. In practice it has been found that, based on an 8 to 9-hour charge, 10% is ample to meet all normal conditions. The explanation lies, of course, in the thermal capacity of the building itself, and in the fact that the heat input is not immediately dissipated as in the case of orthodox continuous heating systems.

Finally, I should like to endorse Mr Parker's appeal for the collation and publication of more detailed results of the operation of existing installations. While we, as manufacturers, are continually co-operating with the electricity supply industry in the provision of technical information and design of thermal storage installations, is this not a case where the Electrical Development Association, in conjunction with the area boards, may be of assistance to all of us?

E. C. Green,
THERMODARE (GREAT BRITAIN) LONDON, S.W.1.

* * *

WITH reference to Mr E. C. Green's interesting comments in his letter published above, the fall in temperature towards evening cannot be attributed to the method of control adopted. Clearly, where no mid-day boost is employed, as with the installation described, the fall in temperature is to be expected due to the charge becoming exhausted towards the end of the day. Where necessary, this can be readily overcome by the employment of the mid-day boost. Again, however, I would like to underline the importance of arranging the switching on time as late as possible in the evening, and switching off as near to the hours the premises are occupied, to enable the block heaters to be in a suitably charged condition at the time required and which is by no means guaranteed by the use of ordinary room thermostats.

With regard to the example given, the rooms from a thermal viewpoint comprise one large space, the divisions as shown consisting of wood and glass partitions only carried to the height of eight feet. In order to obtain the most suitable setting for the QR thermostat, thermometer readings were taken at various points and a mean value determined. Actually, no appreciable difference in temperature has been experienced.

With regard to employing the QA/QR method of control for heaters located in a number of small offices, I see no reason why this arrangement should not be adopted and operate satisfactorily where the heat losses are reasonably

similar. In point of fact, where divisions between small offices are by wood and glass partitions, the heating requirements for two offices can be sometimes satisfied by fixing one large heater in a cut-out in the partitions, thereby reducing the installation cost.

In connection with the amount to be added to the calculated kilowatt load to allow for the hour's supply is not available, I consider 10%, as suggested, is too low. While it is appreciated that it is not desirable to increase the loading more than absolutely essential, from the viewpoint of installation cost, I consider that for the reasons given and to provide an adequate margin for severe weather, the additional amount should be based on the period supply is not available on the off-peak tariff and usually will not be less than 25%. Here the possibility is sometimes present of employing a reduced number of heaters with a correspondingly longer charging period.

A further point that arises here is that the loadings of the range of storage block heaters at present available limits to some extent the selection of the size of heater for small offices, i.e., the heater loading is sometimes either slightly too high or too low.

With regard to the contribution of Mr L. Houldridge (The Eastern Electricity Board) in the issue of the ELECTRICAL TIMES dated 13th October, I would point out that the hours 8 p.m. to 7.30 a.m. were the hours supply was made available by the time switch, the charging period being subject to the dictate of the thermostats and which, under normal conditions, was very materially less, as indicated on the thermographs. The heat losses, as suggested, are definitely high for the floor area involved.

I would urge all those dealing with the development of storage block heaters not to become too despondent if their experiments in different methods of control upon occasion do go adrift by one or two degrees Fahrenheit. Local conditions—requiring individual treatment—the unpredictable British climate and most important of all the appalling shortcomings of many of the low pressure hot water heating systems of electricity's contemporaries—often devoid of any method of heat regulation whatsoever and notoriously inefficient, stand out in sharp contrast to the advantages electricity now offers in this direction and are well appreciated by the average consumer. Much the same could be said in other fields of electrical development.

In conclusion, I would like to take this opportunity of thanking both Mr Green, Mr. Houldridge and also Mr Cameron Brown for their very interesting and constructive contributions, and others who have been kind enough to write to me personally following the publication of the article.

F. D. Parker,
WHITLEY BAY, NORTHUMBERLAND.

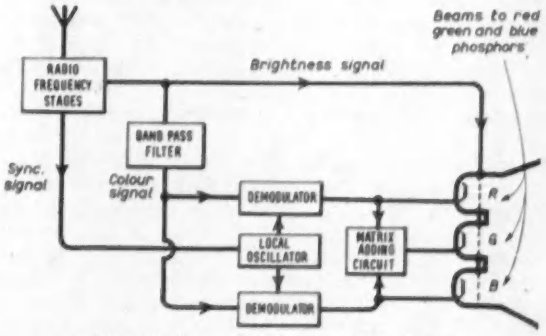
B.B.C. test Colour T.V.

COLOUR television, now being tested by the B.B.C., was demonstrated last week at Alexandra Palace under ideal closed-circuit conditions. Experimental transmissions commenced early this month and take place outside normal programme hours. The purpose of these tests is to determine whether the "compatible" colour television system enables colour transmissions to be received satisfactorily not only by colour receivers, but also in black and white by existing monochrome sets. This transmission service is based largely on the system at present operating in the U.S.A., which was devised by the National Television System Committee.

Let no hasty conclusions be drawn from these experiments. A colour television service will not be available in this country for a number of years. The difficulties lie not in circuit design, but in the present prohibitive cost of the complex cathode ray tube required by a colour receiver.

Compared with a monochrome set, the construction and fundamental operating principles of colour television are not so complex as appear at first sight. Basically, the receiver is presented with two video signals, one containing picture brightness information and the other a colour signal modulated in both phase and amplitude. The technique usually adopted to reproduce the colour information, makes use of synchronous detectors to pass the information contained in the colour carrier side-bands to an adding or matrix circuit. This latter arrangement differentiates the three basic colours with respect to each other so as to "fire" one of the three appropriate electron guns corresponding to the particular colour. The schematic diagram illustrates the basic principle and shows that the three electron guns are contained in the one cathode ray tube.

In effect a colour television tube is three tubes in one, having three inedependent electron guns and three sets of phosphors on the screen which emit respectively red, green and blue light when energised. By a method described later, the electron beam from each gun only energises one particular phosphor, so that the guns may be designated "red," "blue" and "green," with the signals representing the colour components of the transmitted picture being separated by the receiver and applied to the appropriate gun. One of the major difficulties of producing a tube for this medium is the manufacture of a suitable screen. The three phosphors are applied to the screen in a triangular dot arrangement forming a regular pattern, each triangle containing one dot of each phosphor. A short distance behind this screen which contains approximately 5,850 dots to the sq in., lies a thin metal mask perforated with minute holes the size of a phosphor dot trio. The three electron beams are so focused on this mask that on passing through one of these holes they diverge much as light rays from the focal point of a convex lense. Each beam strikes the mask at a constant angle and, therefore, falls on a corresponding dot in the associated trio energising the phosphor and emitting its particular colour. The three beams scan the mask in a similar manner to the single beam in a monochrome receiver tube and since individual dots in a trio are small and closely spaced the mosaic pattern is blended to produce continuous colour.



Schematic diagram of colour television receiver

Power Supply from the Manufacturer's Viewpoint

YESTERDAY saw the delivery of the I.E.E. Supply Section Chairman's Address, when Mr L. Drucquer chose to review the general development of electricity production and use in all its varied fields. In generation the increase in the rate of growth of size of set which was now taking place could be judged by the fact that in 1954 the average size of machine being installed by the C.E.A. was 50 kW, and would rise by 1962 to 140 MW. This was all the more marked when it was appreciated that the maximum set size so far included in the programme was 200 MW and that already sets of 300-400 MW were contemplated. Consideration was being given to future pressures of 4,500 lb/sq in. or more, with temperatures of 1,100° F and over. Although the set capacity increased, the dimensions of sets and power stations did not grow at the same rate due to the better use of old and new materials, and new approaches to layout. Electrically, the use of hydrogen cooling had greatly aided the reduction of alternator size per kVA. Transformers had also profited from the use of more efficient ferro-magnetic materials, particularly the grain-oriented silicon steel, although transport restrictions using present designs, limited the size of a 3-phase unit to about 200 MVA.

The demand for d.c. particularly in the traction and electrochemical fields had led to extensive rectifier development, progressing from rotary convertors to the water-cooled mercury-arc rectifier and thence to the present-day pumpless sealed rectifier. The mechanical contact rectifier had been developed in this country within the past five years and a 260 V unit having a rating of 3,900 kW, 15,000 amp, had operated satisfactorily over considerable periods in commercial service. Light power rectifiers of the semi-conductor type, such as the germanium units had come rapidly to the fore, and work was now in hand on the heavy power versions. Units of 300 kW had been running since 1953, while units up to 2,300 kW and 13,000 amp were under construction.

Switchgear manufacturers had succeeded in keeping well abreast of the increasing fault levels found on heavy interconnected networks, both in the fields of air-blast and of oil circuit-breakers.

Future Prospects

Little doubt existed that the demand for power in this country would continue to increase at a rate of 6—7% per annum at least. Much of this demand was made up of requirements of people for "leisure-consuming" devices which were in turn a direct consequence of the use of electricity for producing more leisure.

The attrition of fuel resources had led to concentrated effort being put into the utilisation of nuclear fuels, as was shown in the White Paper of 15th February of this year, which outlined the atomic energy programme. At the same time investigations were continuing into wind-power, solar energy and pumped storage as means of conserving energy.

Mr Drucquer also commented on the danger to the future of the industry which lay in the human shortage of technical brains. Figures showed that there appeared to be a discrepancy of 30% between the "demand" and "supply" of graduates in pure science and engineering, and concluded by stating that the necessity to increase productivity and remain competitive with the rest of the world made "automation" inevitable, and it must be accepted and encouraged.

Power for New Particles

AN announcement by the U.S. Atomic Energy Commission last week has confirmed postulates of theoretical physicists that a particle of unit mass and unit negative charge—a negative proton—must be added to the list of fundamental particles. Artificial production of the new particle was made possible by the giant "bevatron" now operating at the University of California. This development raises the question of possible further discoveries as still more powerful machines become available, and brings a reminder that the frontier of nuclear physics research is now dependent on heavy electrical engineering.

The bevatron is the latest in the line of particle accelerators that started simply enough with the cyclotron, and all make use in some way of accelerating electric pulses applied to particles circling or spiralling round between the poles of a powerful electron magnet. In the case of the bevatron, protons are injected into the circular vacuum tube between the magnets from a linear accelerator, and at this stage they already have 10 MeV of stored energy. In the bevatron itself they attain 6,200 MeV energy; or in American terminology, 6·2 BeV, whence the name of the machine. Names for particle accelerators can hardly be said to have standardised yet, and machines similar to the bevatron are known in Great Britain as the proton-synchrotron, and in the U.S.S.R. as the synchrophasotron. Another U.S. name is the cosmotron.

Power supply for the bevatron comes from a bank of ignitrons which control 100 MW pulses.

The bevatron has been in operation for some time now, and its place as the biggest proton-synchrotron is likely to be taken soon by a machine nearing completion in Russia, which was described to the Geneva conference. This machine is expected to give an acceleration of 10,000 MeV.

Russian Design

Details of the Russian machine emphasise the engineering magnitude of these latest physicist's tools. The accelerator magnet employed consists of four quadrants with an average radius of 90 ft, separated by straight gaps about 25 ft long across which the accelerating potentials are applied. The magnet weighs about 36,000 tons, and to operate it the reactive power required is 140 MVA.

A linear accelerator is used to bring particles to 9 MeV energy level before they are injected into the vacuum tube lying between the magnet faces. The accelerating period is 3·3 sec, and the protons being accelerated travel 4,500,000 circuits of their orbit before they strike their target with the 10,000 MeV energy. The distance they have travelled by that time is about 2½ times that to the moon.

Is there any limit to the energies that can be reached by such methods? Some of the leading scientists in the field think so, and suggest as one of the principal limiting factors the magnetic field that can be obtained with contemporary magnetic materials. This is considered unlikely to rise beyond 20,000 oersted. There are some more fundamental problems to be overcome as well, and one authoritative opinion has put the limit with present techniques at 50,000 to 100,000 MeV.

From an engineer's notebook

A VIVID memory of my schoolhood is that of the science master explaining the wonders of the sea and the far more exciting stories of the many efforts to extract gold from sea water, or more truthfully, money from company promoters' pockets. Even to us boys the credulity of those who subscribed to such fantastic schemes of collecting the infinitely small quantities of gold known to be present was hardly believable: in these days of sophistication they are probably ranked with the tales of Baron Munchhausen. Yet this quest of gold from sea water, which almost parallels that of the Philosopher's Stone, is still apparently alive today. No more of the old subterfuge of a diver replacing sealed boxes in the sea; in these days it is all done by plastics. More precisely, by polythiolstyrene. This is said to be a new ion exchange resin with a peculiar affinity for the heavy metals, gold, silver and uranium which it binds within its structure by the claw-like nature of its atomic grouping. The metal is removed by simple washing in a strong acid. So far, it is reported that this plastic has been used for recovering copper from waste refining solutions and silver from photographic wastes. So we are still far from obtaining gold from sea water. None the less, if preliminary reports of this new plastic are confirmed, other uses may be found, even to removing radioactive poisons from the body.

* * *

THERMODYNAMICS is such a matter of fact, down to earth, subject that anything new always attracts attention. Not that there is ever anything new in thermodynamics, only new arrangements of known principles. Such is the case with a new refrigerator cycle that has been developed by Philips. The arrangement is a complex one of two pistons working one above the other in the same cylinder in which a reversible cycle takes place. The lower or main piston compresses the gas against the lower face of the second or displacer piston. Then, as the displacer piston, and later in the cycle, both pistons together, move downwards, the gas is forced through an annular passage to the upper part of the cylinder and allowed to expand there. In the annular passage a cooler and a heat regenerator is contained which absorbs the heat from the compressed gas on its way to the cold upper part of the cylinder. After expansion has taken place, the displacer piston moves upwards ejecting the cooled gas through a coil which provides the source of external cooling and then through the regenerator where it absorbs the stored heat before reaching the lower part of the cylinder in readiness for the recommencement of the cycle. Naturally, the nature of the regenerator is the crucial point. It has been found that efficiencies of as high as 99% can be obtained with a regenerator of fine wire made into a felt-like mass; a surprising performance. The cycle, however, is more of specialised than of general interest as may be concluded from the complex double piston arrangement. Further its optimum working temperature lies within the range $-80°$ to $-200°$ C and although it may be possible to extend this range, its application lies essentially to low temperature work such as the making of liquid air.

A SUBJECT in which there has been a spectacular advance in the last twenty years, is that of adhesives. Originating largely from the demand by the aircraft industry, new materials have been developed which have revolutionised some manufacturing techniques. This development has all been on an empirical basis since the mechanism of adhesion is of such complexity that no guiding path of theory has been available. Now it is coming under more searching theoretical study. A new direction to this work has been given by recent Soviet studies which suggest that an answer may be found in electrical phenomena. The more familiar view that adhesive forces were of a molecular or chemical nature was found at variance with the forces required to tear a film under certain conditions. Further, the luminescence or crackling on tearing, are suggestive of an electrical origin. The hypothesis now put forward postulates the formation of two electrical layers at the interface, negative and positive. On tearing, under the intensive electrical attraction, electrons torn from one surface impinge with high energy on the opposite surface, dislodging therefrom positive ions and perhaps photons. It is suggested that conditions are such that new secondary electrons are dislodged leading to discharge. A formula is put forward to cover this mechanism and under controlled conditions experimental confirmation of the calculated figures has been obtained. However, no one pretends that the theory of adhesion can be reduced to simple terms and there are many by-ways of this Soviet suggestion to cover the complexities involved.

* * *

THERE has always been something of a halo of mystery surrounding cosmic rays, since Rutherford found that first unexplained ionisation of gas which led to the suspicion of a cosmic source of radiation. In the fifty years, much has been learned of cosmic rays and their existence has passed into common knowledge. There has remained, however, a sense of awe that has led to many wild theories of their effect on human life and behaviour. As far as I am aware there has never been any scientific evidence to support such views so perhaps I may be excused if I step outside my immediate sphere of interest to record some experiments with a small American crustacean known appropriately as the fiddler crab. This apparently is noted for a regular diurnal variation in the colour of its pigmentation, being paler at night than in the day time. After investigating many possible causes for this colour change it seems by a process of elimination that suspicion came to rest on cosmic rays. As a result of tests over six months a marked parallel was observed and when exposed to higher intensities of bombardment the colour change was more pronounced. From the account I have read I may be excused a certain conservatism towards the nature of these tests. I am always suspicious when something is vaguely attributed to the reaction of the endocrine glands, as in this case. However, this experiment does seem to be a starting point of finding out just what these cosmic rays are doing to us all.—E. R. G.

CLYDE'S MILL Commissioned

The Secretary of State for Scotland sets the turbines in motion

FIRST OFFICIAL CEREMONY OF SOUTH OF SCOTLAND BOARD

LAST week, the formal commissioning by the Secretary of State for Scotland of the two latest 30 MW turbo-alternators at Clyde's Mill power station marked not only the first official ceremony to be held by the new South of Scotland Electricity Board, but also the last set to be commissioned in Scotland by the earlier B.E.A. and the first by the new Authority. The two sets were, in fact, commissioned in March and June of this year and, completing the modern section of the station, make it the largest station in Scotland.

The station, or at least that part of it on which last Wednesday's proceedings were centred, may be regarded as a "conventional" station in that it comprises four 30 MW turbo-alternators and eight boilers of 180 klb/hr evaporative capacity. The complete station, however, dates from 1915 and comprises three distinct sections—low pressure employing twelve 33 klb/hr boilers and two 18·75 MW sets operating at 220 lb/sq in., 625° F; intermediate pressure, with sixteen 80 klb/hr boilers and four 30 MW sets operating at 400 lb/sq in., 770° F, apart from the high pressure section already mentioned.

Site Details

Located within the largest electrical load centre in Scotland, the station stands on the south bank of the River Clyde some seven miles upstream from the centre of Glasgow, taking its name from a Mr Clyde, who previously owned a mill on the site. Included in the site is the associated 132 kV grid substation which is also the Scottish terminal of the 275 kV line from Carlisle, at present operating at 132 kV. After the initial installation, carried out by the Clyde Valley Electrical Power Co., the extensions have been effected with the assistance of Strain and Robertson, consultants originally to the Clyde Valley Co., then to the South West Scotland Electricity Board, and now to the new Authority.

All the buildings are of steel frame and brick construction on mass concrete foundations. The station itself bears largely upon sandstone rock, although immediately behind the station boulder clay exists and hence the cooling towers are supported on piles. Overall, the station is 1,133 ft long, the site covering some 70 acres. Circulating water intakes and pump houses are arranged in line along the water front, behind them stretching the turbine house and, at right angles to and behind the turbine house, the various boiler houses. Coal-handling plant and the coal stores are located behind the boiler houses. Beyond them lie the control room and 33 kV switch room, 132 kV transforming substation, 132 kV switching station and the two cooling towers.

Turning to the h.p. section in greater detail, the boilers are of the Yarrow single flow water-tube type with two-drum superheater, Bailey furnace, Babcock and Wilcox economiser, and Yarrow tubular air heater, employing twin chain grate stokers and having a test efficiency of 87%. Control may be either completely automatic or manual, effected from a central position in the boiler house. Feed water is supplied via six feed pumps each of 300 klb/hr capacity at 800 lb/sq in. with four steam-driven 250 klb/hr pumps as standby.

The four English Electric turbines in the h.p. section, having t.s.v. conditions of 600 lb/sq in., 850° F, are of the two cylinder impulse/reaction type with 22 impulse stages in the h.p. cylinder and one impulse and seven reaction stages in each flow of the double flow l.p. cylinder. For each unit there are two l.p. and two h.p. feed water heaters operating on the closed feed system. Having a design vacuum at full load of 28·78 in. absolute with a cooling water temperature of 70° F, the two double-flow condensers to each unit present a combined cooling surface of 30,000 sq ft. Cooling water requirements of each turbine are 24,000 galls/min.

Cooling, in fact, forms one of the major problems of the station, which requires 230,000 galls/min in all, whereas the minimum flow of the Clyde can fall to 120,000 gall/min thus requiring the use of the two cooling towers. During extreme summer conditions the total cooling requirements just exceed the provision, and load has had to be reduced for this reason. Provision, however, is made for a further cooling tower which will be required if, as may be possible, the l.p. section is replaced in the future by a 60 MW, or even 120 MW, generator.

Of the four alternators, the older pair generate at 11 kV, but the output is transformed to 33 kV and connected to the station's 33 kV bars which feed into the local 33 kV system. Provision, however, is made to supply the 132 kV system from these bars, and in fact, most of the output of these sets has been fed into the 132 kV grid. Output from the two later sets generated at 11 kV is transformed direct to 132 kV and fed into the 132 kV bars of the grid substation.

This substation forms the focal point of the Authority's system, being the link between the east and west sides of the South of Scotland. From the substation, overhead lines radiate to Bonny Bridge and Motherwell to the east, and Port Dundas, Dalmarnock, Paisley and Kilmarnock to the west, whilst a further double circuit line supplies Newarthill substation. The outdoor switchgear comprises sixteen 3,500 MVA oil-break circuit-breakers providing eight breaks per phase. Non-linear resistors are shunted across each break to equalise its loading. Bus zone protection is installed.

The 132 kV busbars are in two sections, each section being connected through isolators to one of the pair of 275/132 kV auto-transformers terminating each of the two 275 kV lines from Carlisle. The transformers thus act as interbus transformers, or interbus reactors, to prevent the fault capacity from reaching too high a level. Since the two 275 kV lines, at present energised at 132 kV are transformer feeders, control is effected at Carlisle, a fault tripping out the associated 275 kV line there. Metering is at present effected at Clyde's Mill, but will, eventually, be arranged at Carlisle.

PRINCIPAL CONTRACTORS

CIVIL ENGINEERING WORKS:

Foundations	Holst and Co., Ltd.
Steelwork for Buildings	Redpath Brown and Co., Ltd.
Buildings	W. and J. R. Watson, Ltd.
River Works	Wilson, Kinmond and Marr Ltd.
Overhead Cranes	Marshall, Fleming and Co., Ltd.

BOILER PLANT:

Coal and Ash Sidings	Wilson, Kinmond and Marr Ltd.
Coal-handling Plant	Mavor and Coulson Ltd.
Boilers	Yarrow and Co., Ltd.
Fan Plant	James Howden and Co., Ltd.
Ash-handling Plant	Babcock and Wilcox Ltd.
Dust-handling Plant	John Thompson Industrial Construction Ltd.
Chimneys and Flues	Yarrow and Co., Ltd.

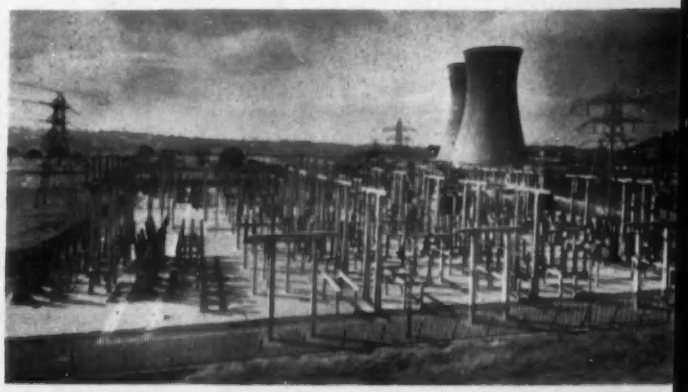
TURBO-ALTERNATOR PLANT:

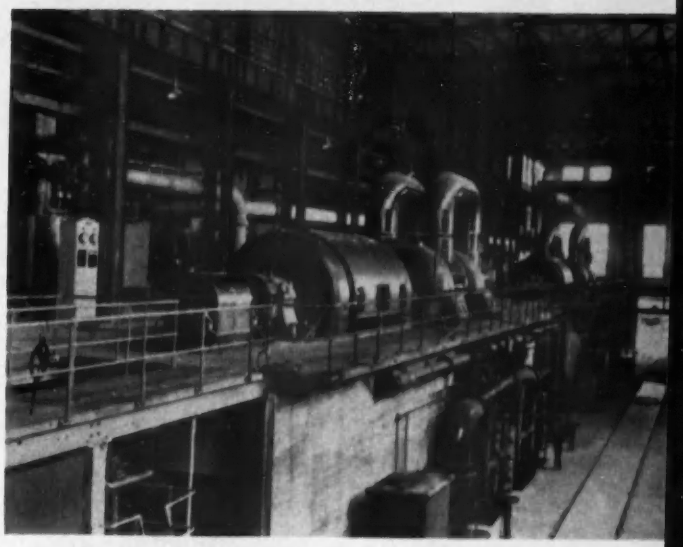
Turbo-alternators	English Electric Co., Ltd.
Condensing and Feed Heating Plants	Mirrlees Watson Co., Ltd.
H.P. and L.P. Pipework	Stewarts and Lloyds Ltd.
Boiler Feed Pumps	G. and J. Weir Ltd.
Circulating Water Pumps	Drysdale and Co., Ltd.
Circulating Water-screening Plant	F. W. Brackett and Co., Ltd.

SWITCHGEAR AND TRANSFORMERS:

33 kV Switchgear	General Electric Co., Ltd.
132 kV Switchgear	Metropolitan-Vickers Co., Ltd.
Auxiliary Switchgear	Reyrolle and Co., Ltd.
Generator Transformers	Bruce Peebles and Co., Ltd.
Cabling	James Kilpatrick and Son Ltd.

Metrovick 132 kV, 3,500 MVA outdoor switchgear at Clyde's Mill and below, centre, the two latest turbines at the station





Above, a view of one of the boiler firing aisles

Electricity and the Motorist

A BRIEF ACCOUNT OF SOME EQUIPMENT AT THE MOTOR SHOW

The Armstrong Whitworth electric impact wrench is a new item at the show

EYE-catching high-performance cars and the now comparatively luxurious popular motors with up-to-date styling always steal the show at Earl's Court each year, but for the budget motorist the more achievable extras and accessories which dominate the gallery stands are usually the greater attraction. Big or small, rich or poor, however, the efficient motor car relies on efficient auxiliary equipment of which the electric system holds a place of great importance, so it is in the accessory and component section where we find the greatest interest.

Accessories and Components

An interesting tool, recently introduced by Armstrong Whitworth and Co., Ltd., is their rotary electric impact wrench with a mechanism giving hammer blows when resistance is met. It takes all the back-breaking effort out of removing or applying nuts, bolts or other threaded fasteners, and makes the task of tapping threads, driving bolts and extracting studs very simple indeed. At present it is available in two kits, with or without carrying case, but including six hexagon sockets.

Belling and Lee feature their very successful "Save-a-Life" lamp, a small portable unit which gives a red flashing warning light in one direction and a white floodlight for roadside repair work.

A soldering tool of the tong pattern is shown by the Commercial Ignition Co. for operation from a 6 V battery. This "Venum" tool, which is new to the show, affords a means of applying localised heat not damaging the surrounding insulation material. In normal use the only expandable parts are the detachable electrodes. The Vibro-Sprayer and the marking tools featured by Burgess Products Co., Ltd., are well known to readers. Chloride Batteries feature the well tried and trusted Silver Exide batteries in "flush connector" and standard designs and Exide Double Life Batteries.

Ekco exhibits have included this year two new models added to their CR152 range of radio receivers. CR152/5 is for 6 V battery operation, whilst CR152/6 is similar to standard CR125 receivers but has been redesigned to meet the styling and colouring in certain vehicles.

First TV set for cars powered by low voltage supplies is this 9 in. tube Ekcovision receiver built into a Freestone and Webb Rolls-Royce

Cooper and Co. (Birmingham) Ltd. who advertise in these pages their range of felts for industrial use, make a feature of the Croid Cooper method of machinery installation adopted by many car manufacturers.

Delaney Gallay Ltd., who were known in the trade for their range of convector heaters, feature a new "Good Companion" car heater and demister, which sells at £9. 5s. in standard black crackle finish. Rated 21 W this heater develops 5,100 BTU's. Edison Swan's exhibit comprises examples of starter batteries and car-wiring cables, Tungar battery chargers, and Royal Ediswan car bulbs.

Helec's Vehicles (Mfrs.) Ltd. feature the Elexmatic Transmitter, a form of semi-automatic transmission offering two-pedal control with no power loss and greatly reduced fuel consumption. A simplified "Beamsetter," shown by Joseph Lucas, was designed to enable mechanics without special knowledge to adjust lamps in a short time, it employs a light meter to give a maximum reading when the lamp is correctly aligned. The recently-introduced Lucas all-electric "Screenjet" uses a small motor impeller to operate the water jet. It costs 63s.

Philips Electrical Ltd. feature their new "MotoRadio" car radio for 12/6 V operation. This has a separate speaker and a chassis easily accessible for servicing. Their "Philishave" battery dry shaver can be operated from the car electric system by means of special dashboard adaptors.

A feature of importance on the Ross Courtney display is the "Petromag" safety lock which turns off petrol and ignition. It is easy to fix and costs 42s. fully guaranteed. Two new items in the S. Smith and Sons display were an electric water temperature gauge and a cigarette lighter.

Crypton Equipment Ltd., a member company of L.D.C. Group, feature examples from the wide range of equipment they produce for battery service, electrical servicing and engine servicing, whilst G.S.L. Products Ltd. make a display of "Startall" equipment. A newcomer to the Startall range is the "Startall Home Charger." Battery chargers of all sizes and a range of low voltage safety transformers are shown by F. C. Heayberd and Co., Ltd., whilst Partridge, Wilson and Co. proudly present their new range of Davenset commercial battery chargers for a.c. mains with magnetic voltage control. Ignition components, test equipment and battery chargers, form a similar display by Runbaken.

The company's new Family battery charger forms part of the G.E.C. display which also includes the new Osram 24 V, 6 W, bulb for side and tail lights of commercial vehicles. Special cut-away exhibition batteries showing and Nilcrode alloy grids and Dri-Stor microporous separators, normally hidden, are a feature of the Crompton car battery display on the Young Accumulator Co.'s stand.

INDUSTRIAL MAINTENANCE

STARTING TORQUE

Notes on Its Importance in Selecting an Electric Motor

THERE are many applications of electric motors in which a decision about motor rating can be confined to full-load h.p. requirements and speed of the machine that can be driven. Starting is relatively infrequent, and once started the driven machine runs steadily without significant speed variation. From time to time, however, the works electrical engineer is faced with choosing a motor for a more variable duty, and amongst the factors he then has to consider is torque, especially starting torque. If the starting torque required is substantially in excess of the running torque, there will also have to be careful consideration of the current that will be drawn from the mains.

Definitions and Formulae

To begin with a definition, torque of course means simply turning effect, and it is expressed as a product of force and distance; e.g., pounds-feet. The torque acting on a shaft in any particular case may be represented by a weight hanging at the end of a horizontal lever attached to the shaft, the torque being equal to the length of the lever times the magnitude of the weight. In fact, this equivalence is applied directly in measuring torque. Torque is, of course, also directly related to power output, the other factor being speed. The equation connecting the two is:

$$P = 1{\cdot}9\,TN \times 10^{-4} \text{ or } T = \frac{N}{5250P}$$

where P = power in horse power
T = torque in pounds-feet
N = speed of rotation in r.p.m.

To return to the question of starting torque, this may be determined approximately for a given machine by the method shown in Fig. 1. A few turns of rope are taken round the pulley or coupling of the machine concerned, and finished with a spring balance. A pull is exerted on the balance until the shaft just begins to turn, and the reading of the balance at this instant is noted. This gives the force component of the torque: the distance factor is obtained by measuring the radius from the shaft centre to the pulley

Fig. 1. Measurement of starting torque using spring balance and a cord round the machine coupling

circumference, in feet. The product of the two is the starting torque in pounds-feet.

Having determined the required starting torque, it is next necessary to consider how starting torque is related to maximum torque for various motors. The representative torque/speed characteristic curves accompanying this article gives some idea of the answer to this question, and Table I summarises the appropriate values.

TABLE I.—TYPICAL STARTING TORQUE VALUES FOR MOTORS

Type of Motor	Starting torque with f.l. torque = 100
A.C. Induction Motor:	
s.c.—d.o.l. starting	100–120
s.c.—star-delta	30–40
s.c.—double cage rotor, d.o.l.	180–300
s.c.—double cage rotor, d.o.l.	60–100
Wound rotor	200–300
D.C. Machines:	
Shunt	200
Series	400
Compound	200–300

Induction Motors

Squirrel cage induction motors of normal design, when started direct-on-line, develop a torque that is little, if at all, above the full-load rated torque. On the other hand, the current may be many times the full-load current—5 to 6 times is normal. For this reason, some special starting precautions are often required. One of the most common methods for a three-phase motor is to use a star/delta starter. This is effectively a form of reduced-voltage starting, and reduced voltage means reduced torque. Starting torque with a star connection is about one-third of full-load torque with the windings of the same motor connected in delta. As is well known, the starting current is reduced with this connection to less than twice full-load current.

The relatively low starting torque available with the plain squirrel cage motor is one of its main shortcomings. A compromise which goes some way towards keeping the essential simplicity and relative inexpensiveness of this type of motor is the double-cage design in its various modifications, which gives relatively high resistance at starting. Here the starting torque may be arranged for a wide-range of multiples of full-load torque. The usual designs give about 2—3 times full load torque at starting with d.o.l. starting. It must be realised, however, that some of the qualities of the plain squirrel cage motor are lost. In particular, the maximum torque is reduced (see Fig. 3) and there may be some trouble with rotor overheating if frequent starting is necessary.

With slip-ring induction motors the problem of starting torque is considerably eased. Rotor resistance inserted during starting increases starting torque to 2—3 times full-load torque is required, without the disadvantages that apply with double-cage rotors.

D.C. Motors

The shunt-wound d.c. motor has a torque-speed characteristic such that many times full-load torque would be developed at starting, if direct-on-line starting were practicable. Some form of resistance starting has to be used, however, and the starting torque required is one of the factors that has to be taken

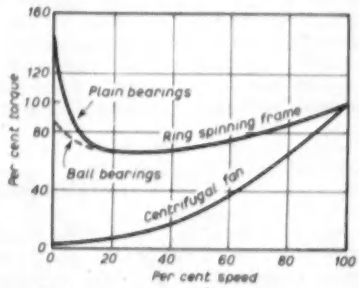


Fig. 2. Torque requirements for starting two machines of different characteristics, showing typical fan curve and effect of ball bearings

into account in determining the starter design. To a first approximation, for a shunt-wound motor, on full field, torque is directly proportional to armature current.

With the simple series-wound d.c. motor, the relation between torque and current is less simple. To a first approximation, the torque is proportional to the square of the current. As a result, with starting current restricted to twice full-load current, the starting torque will be about four times full-load torque. This gives the series motor its suitability for traction and crane drives where torque has to be greatest at low speeds.

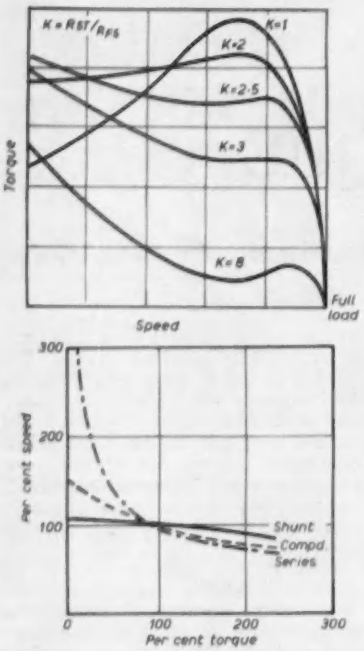


Fig. 3. At the top are seen characteristic curves for double cage rotors, for various ratios of starting to running resistance. Below are curves for d.c. motors

Compound-wound d.c. motors come somewhere between simple series- and shunt-wound motors so far as torque-speed characteristics are concerned.

Accelerating Torque

So far, this article has been confined to the question of starting torque as it affects the ability of the motor to start the driven machine rotating. It is obvious that in many applications another question of importance is how quickly the machine will run up to speed. This is determined by the torque/speed characteristic of the motor on the one hand, and the weight and shape of both the rotor of the motor and the revolving parts of the driven machine on the other. Weight and shape come into the question because they determine the "moment of inertia" of the rotating system. This is a characteristic whose derivation cannot be discussed here. It is expressed in "lb-ft^2", and is related to torque by the expression $T=kIa$.

where T = torque, k = constant, I = moment of inertia, a = angular acceleration.

In such calculations the method of proceeding is first to determine the torque required to drive the load at each speed up to full speed. This may be known from manufacturers' data or on a basis of previous tests. Then the difference between motor torque and load-driving torque at each speed gives the torque available for acceleration. It is then possible, by applying the equation above, to determine the time taken to accelerate the machine. A fuller discussion of this problem is given in motor manuals, a particularly clear example being available in "The Choice of Electric Motors," published by the B.T.H. Co. Essentially, the method used is to split the accelerating torque curve into sections each of which may be represented by a straight line, and then calculate the time taken to accelerate through that speed range from the formula

$$(t_2-t_1)=\frac{I\,(N_2-N_1)}{308\ T_a}\text{ seconds.}$$

when N_1, N_2 are the initial and final speeds in r.p.m. for the sections selected.

I is the moment of inertia of the rotating system in lb-ft^2.

T_a is the average torque in the section selected.

A graphical representation of the results of such a calculation is seen in Fig. 4.

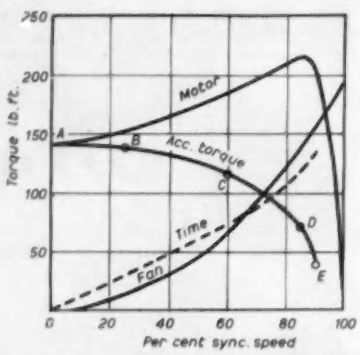


Fig. 4. Torque speed curves for star-delta started i.m. driving a fan. Time values in seconds 1/25 of torque values

As a conclusion to these notes on motor torque, a mention of B.S.2613:1955 "The Electrical Performance of Rotating Electrical Machinery" seems desirable. This standard makes no mention of starting torque, but it does require that motors shall be capable of producing excess torque for a 15-sec period as shown in Table 2. It should be noted that this is a minimum value, and that many machines are capable of developing substantially greater torque.

TABLE II.—MOMENTARY OVERLOADS PERMITTED BY B.S.2613

Type of Machine	Excess torque for 15 second %
D.C. Motors:	
Short time rated; irrespective of h.p....	100
Continuous rated permitting overload; irrespective of h.p.	100
Continuous maximum rated up to and including 50 h.p. at all speeds	100
Continuous maximum rated above 50 h.p. up to and including 150 h.p. at all speeds	75
Continuous maximum rated above 150 h.p. at all speeds...	50
A.C. Induction Motors: —Normal type	
Short time rated; irrespective of h.p....	100
Continuous rated permitting overload irrespective of h.p.	100
Continuous maximum rated up to and including 50 h.p. at all speeds	100
Continuous maximum rated above 50 h.p. up to and exceeding 500 h.p. at all speeds	75
Continuous maximum rated above 500 h.p. at all speeds...	60
Synchronous (salient pole) motors	50
Synchronous induction motors (cylindrical or salient pole)...	35

Acknowledgment is due to the B.T.H. Co. for permission to reproduce the curves that illustrate this article. They are taken from "The Choice of Electric Motors," by C. V. Hill, issued as Publication G11011.

Typewriter Insulation

A D.C. armature, after more than 30 years service in Nigeria, went down to earth. Although the machine had changed hands during that time, the windings appeared to be the originals, so there could not be much to complain of in the workmanship. The problem, however, was how to get the generator back into use, and the sawmill on which it depended into production.

There were no local facilities for dealing with an armature of this size; it being 26 in. diameter, and nearly 7 ft long over the shaft. The windings consisted of five square conductors, made up into a strip and cotton covered overall. Naturally nothing like this was available. After the fault had been located, and sufficient of the coils lifted to remove it, it was found that the insulation resistance of the remainder seemed adequate. It was therefore decided to re-insulate all the coils which had been disturbed, and to replace them. Unfortunately all the cotton tape which could be found was much too thick, and even a search of numerous textile merchants failed to locate anything suitable. In fact, the problem appeared to be insoluble until an old typewriter ribbon was spotted, which proved to be have been woven to just the right specification. After washing in soap and water to remove most of the ink, the ribbons were dried in the sun, and after being applied to the conductors, painted with an air-drying varnish.

It is fortunate that most Nigerians don't like to throw anything away, so, as soon as the news got round that "Baba Oyingbo" was willing to pay 6d. each for old ribbons, many clerks in neighbouring offices were quick to earn a little pocket money. In all about 100 ribbons were needed to complete this winding repair.—*J. Mellanby.*

Arrow D.O.L. Series 66 Magnetic Starter

DATA SHEET 20

THIS Arrow starter is suitable for single- or three-phase motors up to 10 h.p., 550 V. Approximate size is 5½ in. x 9 in. x 4 in., and weight 7 lb. complete.

Heater elements from the tables provide overcurrent protection of 125% of full load current stated. For 140% protection use next higher value.

The Arrow thermal overload relays are calibrated for use over an ambient temperature range of 20° C–30° C. If the ambient is outside this range:

For every 11° C below 20° C use one size lower.

For every 11° C above 30° C use one size higher.

The Arrow RA 66 starter is a neat, compact and lightweight unit containing a four-pole contactor and provided with an indirectly heated thermal overload in each phase. Provision is made for the fitting of one or two auxiliary switches operated by the contactor unit.

The case (not illustrated) is a clean die-casting with two 1 in. knockouts on each side and on the top and bottom. There is no back entry. The lid of the starter is hooked on and secured by one screw and carries the local stop and start push buttons with a separate reset knob, all clearly marked. The general appearance is good and follows the modern trend in industrial design.

The interior mechanism, illustrated in Fig. 1, right, is easily withdrawn by removing one top screw and slackening two bayoneted screws retaining the main back plate.

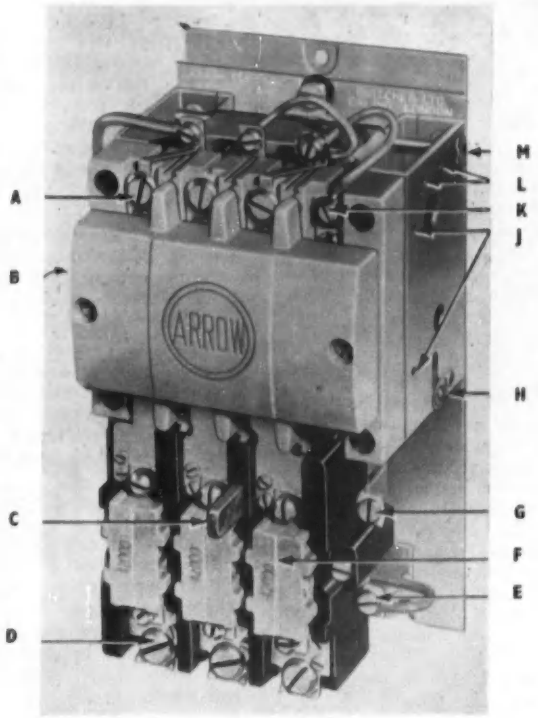


Fig. 1. General view of an Arrow Series 66 direct-on-line magnetic starter. A, line terminals. B, position for stop switch. C, reset plunger. D, load terminals. E and G, control circuit from overload relays. F, heater. H, Solenoid pull rod. J, Fixing holes for start switch. K, contactor auxiliary terminal. L, fixing holes for auxiliary switch. M, Solenoid anchor rod

The Contactor

This unit differs from others in many respects. It is quite compact and only occupies 3 in. x 3 in. x 2½ in. approx. It is built on a pressed cadmium-plated steel frame mounted on the main back plate. The stationary contact moulding of "Alkyd" synthetic, is held on the top of the frame by four screws and houses the three main line contacts (of ⅜ in. diameter silver) and a smaller pair of auxiliary contacts for the control circuit.

A cover fits snugly over the contacts and the tongue and groove construction gives complete phase separation even if the cover has not been fully tightened down. The "Alkyd" material chosen for these mouldings has extremely high resistance to tracking.

In this contactor the solenoid pulls the armature up vertically. The armature is gravity controlled and assisted by springs on the linkage which converts the vertical pull of the magnet to a horizontal motion in the moving contact bar. This is shown in Fig. 5. The moving contact carrier (8) is mounted on a stirrup and coupled to a parallel link motion

The tables below give horse-power ratings and catalogue numbers for the contactor in standard form. On the right is a table of available overload relay heaters

MAXIMUM HORSE-POWER RATINGS

A.C. volts	110/115	220/250	400/550
1 phase	1·5 H.P.	3 H.P.	5 H.P.
2 and 3phase	3 H.P.	5 H.P.	10 H.P.

COIL CATALOGUE NUMBERS

Coil Voltage* 50 Cycles	Local Control	Remote Control Enclosed	Remote Control Unenclosed
100/110	66110 L	66110 R	66110 UR
200/220	66220 L	66220R	66220 UR
400/440	66440 L	66440 R	66440 UR

*Coils for alternative voltages and frequencies can be obtained on request.

OVERLOAD RELAY HEATER TABLE

Heater Cat. No.	Trip Amps	Full Load Motor Amps	Heater Cat. No.	Trip Amps	Full Load Motor Amps	Heater Cat. No.	Trip Amps	Full Load Motor Amps
42000	0·72	0·57	42009	3·15	2·51	42018	12·0	9·60
42001	0·90	0·72	42010	4·00	3·20	42019	12·5	10·1
42002	1·07	0·86	42011	5·00	4·00	42020	13·5	11·1
42003	1·25	1·00	42012	5·70	4·60	42021	15·5	12·4
42004	1·40	1·12	42013	6·90	5·50	42022	19·0	15·2
42005	1·60	1·28	42014	8·00	6·40	42225	22·0	17·6
42006	2·00	1·60	42015	8·60	7·10	42226	25·0	20·0
42007	2·30	1·84	42016	10·0	8·00	42227	29·0	23·0
42008	2·70	2·15	42017	11·0	8·90			

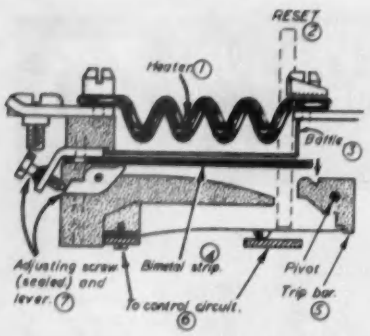


Fig. 2. Details of overload units

operated by the steel bar (9) sliding in slots on each side of the contactor frame. Note that the linkage gives mechanical advantage enabling a smaller and lighter solenoid to be used. Moreover, the linkage is so arranged to impart a slight rubbing contact at the end of the closing stroke.

The sliding bar (9) and H in Fig. 1 is pulled by the armature as in Fig. 5.

The magnet frame is quite conventional and in this contactor the whole unit is plated and has an unusually clean finish. The magnet assembly is bolted to two side plates sliding in guides fixed to the contactor frame and further retained by the bar (10), Fig 6 and M in Fig. 1. The solenoid pulls by a loose loop around (9) and since the side guides have a little clearance the whole magnet pivots slightly on bar (10) thus making it fully self aligning. The shaded poles are robust and securely fixed.

The Overload Unit

We have already stated that these releases are of the indirectly heated bi-metal type and one is shown in section in Fig. 2.

The three relays are housed in a moulding forming a cell for each phase with a common trip bar (5) in a cavity underneath. Two types of heater are shown, one in the photograph and a heavier type in Fig. 2. Below the heater element is a steel baffle plate (3) covering the bi-metal element strip (4). This strip is fixed at one end with two screws. It is adjusted and sealed by the makers by means of a very neat pivoted lever not seen unless the whole unit is dismantled. This lever should not be interfered with.

From Fig. 2 it can be seen that movement of the bi-metal strip as a result of excessive current in the heater (1) will cause the tip of the strip to bend down and rotate the pivoted trip bar (5). This will allow the trip bar to release the spring contact and open the control circuit (6) and so trip the contactor.

Through the overload unit passes a moulded push rod (2) which when depressed will remake the circuit (6) and allow the end of the spring contact to be held by the shoulder in the trip bar. The trip bar is controlled by a light return spring.

Continued operation has no effect on the switch mechanism or calibration and premature resetting will not damage these relays.

Dismantling

The whole interior is easily withdrawn from the case and each complete unit can be released without any difficulty since the fixings are obvious by inspection and there are no loose or concealed parts.

To replace coil disconnect coil leads, remove circlips on rod M and draw rod from frame. The coil and magnet frame can now be lifted out, leaving the armature in position in the contactor.

The split pin is next removed and this will release the two internal guides and enable the coil to be extracted.

Contact Replacement

Since all the fixed contacts are mounted on the face of the moulding with no-back fixing, removal is simple. The moving contacts are retained on the moulded carrier by small spring loaded catches. Lift the contact, rotate the catch through 90° and the contacts are thereupon free.

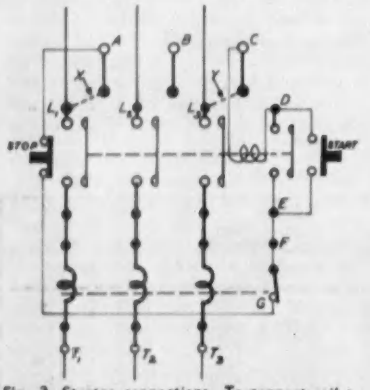


Fig. 3. Starter connections. To connect coil to separate supply remove links X and Y and connect supply to terminals A and C

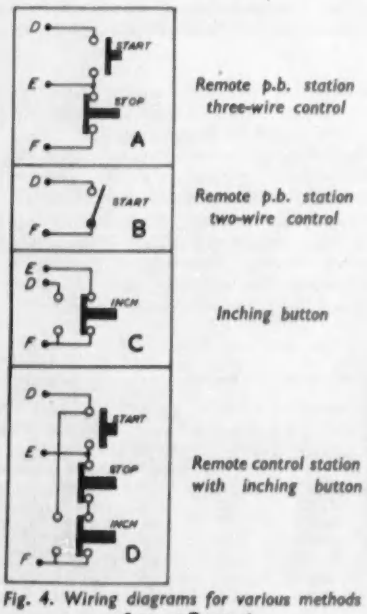


Fig. 4. Wiring diagrams for various methods of remote control

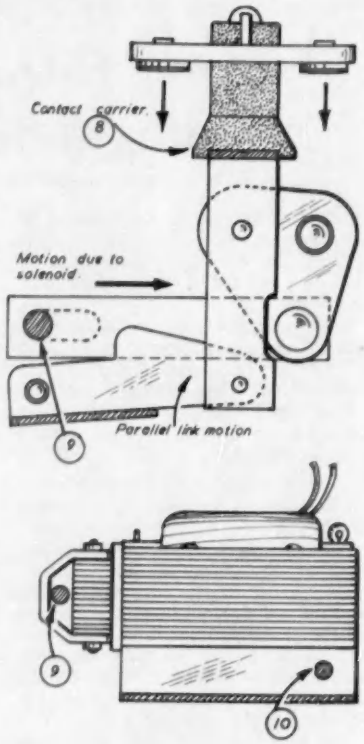


Fig. 5, top, shows the solenoid link motion, while below, Fig. 6, is shown the solenoid itself with sliding bar

The Overload Unit

The heater can be changed without disturbing anything else by undoing the two fixing screws.

Should complete dissembly be necessary a little more care is required. The main moulding is fixed to the frame by two screws. The back is covered by a sheet of insulating material which when removed will allow two small moulded pieces to drop out. These pieces serve to retain the pivot of the trip bar in position.

The control circuit contacts can now be reached.

The bi-metal element is retained by two screws and is covered by a small moulding on which rests one end of the heater. See Fig. 2.

Maintenance

We can only repeat what we have said so often about these modern starters. Keep them clean, replace badly worn parts and don't fiddle with them. A little lubricant may be required on the moving link motion, especially in situations where fine dust may percolate into the mechanism.

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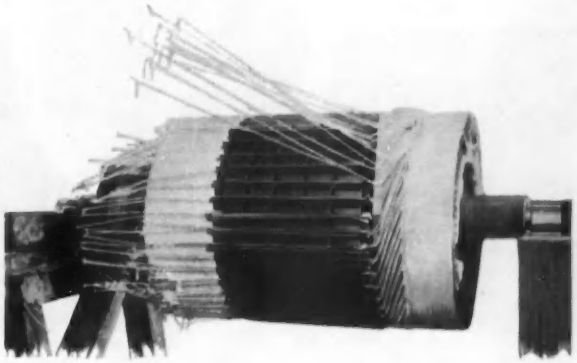

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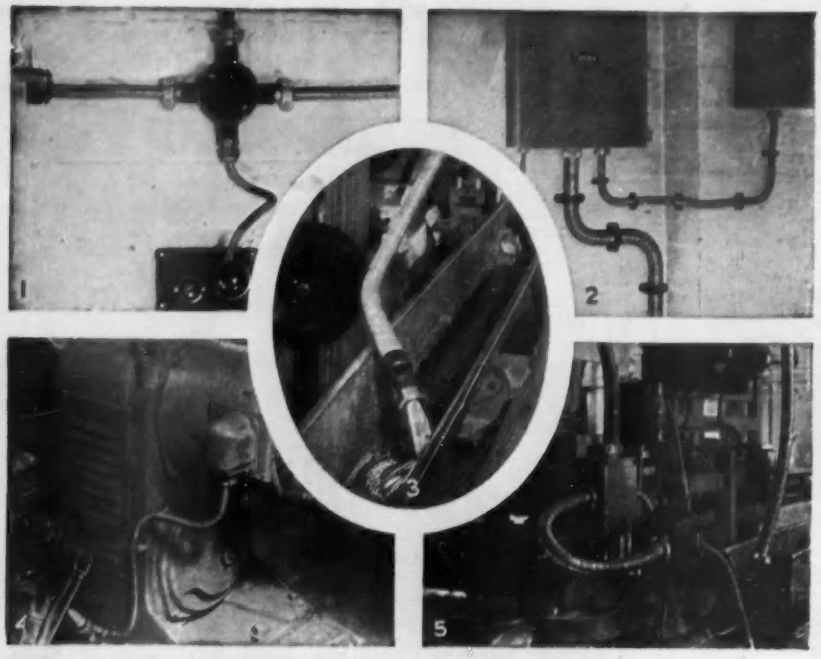

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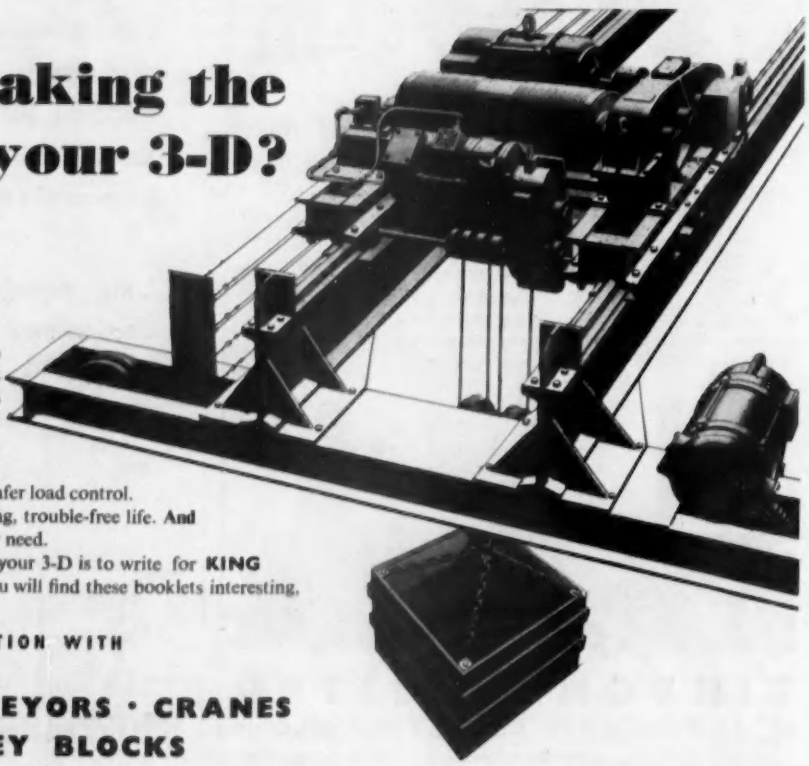

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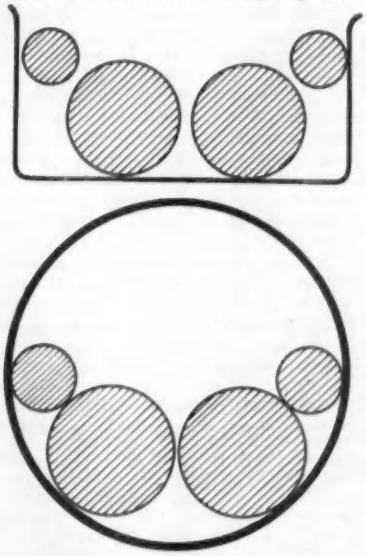
I.E.E. Regulations in the Factory

13TH EDITION CHANGES IN THE LIGHT OF THE FACTORIES ACTS

REGULATIONS for the Electrical Equipment of Buildings is the full title of the I.E.E. Wiring Rules, and nothing in that wording excludes factories. Although the Electricity Regulations under the Factories Acts must take precedence as an absolute legal requirement, there are many sections of the I.E.E. rules which are in every way applicable, and which set a minimum standard for good practice. The introduction to the latest edition of the I.E.E. Rules (the 13th, published last month) states specifically that the Wiring Rules supplement the Electricity Regulations under the Factories Acts.

In this report, it is of interest to look more closely at some of the changes made for the 13th edition of the I.E.E. Rules, in the light of factory electrical practice. The outstanding matter of interest is undoubtedly the earth loop requirements now written into the Rules. Briefly, these require that the current which can flow when a direct phase-to-earth fault occurs shall be at least three times the rating of the fuse protecting the circuit concerned, or 1½ times the setting of the overload circuit-breaker (a circuit-breaker with an inverse-time characteristic is regarded as a fuse). Alternatively, an earth-leakage circuit-breaker has to be installed.

This is a far more precise requirement than the relevant regulation, No. 21, in the Electricity Regulations. This merely requires that "where necessary to prevent danger, adequate precautions shall be taken either by earthing or other suitable means to prevent any metal other than the conductor from becoming electrically charged." No definition of "adequate" is given in the Regulations but H.M. Senior Electrical Inspector of Factories has officially recommended that the resistance of the local connection to earth should be low enough to allow the passage of three or four times the minimum operating current of the protective devices concerned, assuming the other impedances in the fault circuit to be neglected. (The other impedances are: (i) impedance to the source of supply and its connection to earth; (ii) impedance of supply line and wiring; (iii) impedance of the fault.) Thus the new I.E.E. Regulation lines up closely with what was previously recommended as good practice: if anything, it is more stringent.



Conduit can have 40% of its cross-sectional area filled with cables, trunking 45%. The proportions are shown here. Ducts, not shown, may be filled to the 35% level

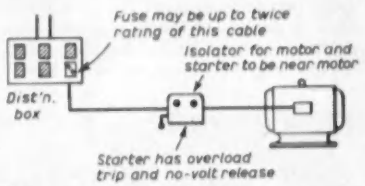
The test laid down in the new edition is the use of an earth-loop circuit tester, and this again matches the existing recommendations of the factory inspectorate. The tester, of course, takes into account all the components of the earth-fault circuit except the impedance of the source of supply and the fault impedance. Although definite requirements for impedance of earth continuity conductors now disappear from the I.E.E. Rules, there is a recommendation in a note that the continuity conductor should not contribute more than one ohm to the total earth fault loop impedance. Of course, to meet the fault currents possible in factory installations it must often be lower.

The Electricity Regulation (No. 2) which applies to cables is a typical example of the very generalised wording with which this code abounds. It requires that "all conductors shall either be covered with insulating material and *further efficiently protected* where necessary to prevent danger, so that they shall be so placed and safeguarded as to prevent danger so far as is reasonably practicable." The equivalent section in the I.E.E. Rules is that dealing with installing of conductors and cables, and the interesting change here is the introduction of the space factor idea.

Space factor is defined as "The ratio of the sum of the effective overall cross-sectional areas of cables forming a bunch to the internal cross-sectional area of the conduit pipe, duct or trunking in which they are installed. The effective overall cross-sectional area of a non-circular cable is taken as that of a circle of diameter equal to the major axis of the cable." Effectively then, space factor is the ratio of the space actually occupied to that available.

Space factors suggested as maxima in the 13th edition are 40% for conduit, 45% for trunking, 35% for ducts.

A rule which has often caused difficulty to factory electricians is that dealing with protection of the cables feeding a motor. The point at issue is that the rating of the fuse involved must often be considerably in excess of that corresponding to the full-load rating of the motor, in order to allow the starting current to flow without causing operation of the fuse or deterioration of the fuse element.


Fuse may be up to twice rating of this cable
Isolator for motor and starter to be near motor
Dist'n. box
Starter has overload trip and no-volt release

The new requirements for fusing motors are here presented graphically. The fuse may be twice the final sub-circuit cable rating

The wording of the rules concerned has now been made more precise. There is first of all an absolute requirement for "a suitable device providing means of protection against excess current in the motor or in the cables between the device and the motor, e.g., in the event of overload or failure of the motor." This rule is of course met by the relays commonly provided in the motor starter. Next, so far as the motor circuit is concerned, "cables carrying the starting, accelerating and load current of a motor shall be of a rating at least equal to the full-load current of the motor when rated in accordance with the relevant British Standard."

There follows, in I.E.E. Regulation 316B, the ruling with which we are particularly concerned here. It calls for the final sub-circuit supplying the motor to be protected by a fuse not exceeding the current rating of the cable (or by a circuit-breaker whose trip setting is not more than twice the cable current rating). But it permits an exception. Where the special protective devices for the motor mentioned above are fitted, the rating of the fuse protecting the final sub-circuit may be up to twice the rating of the cable used. This, of course, will normally give a reasonable margin for starting currents.

To summarise all this, if a motor is controlled by a starter having an overload trip, the fuse in the distribution board from which the motor circuit is fed can be up to twice the current rating of the cable between distribution board and motor starter.

Investigation into Breakdowns

Scientific Enquiry Is Often Worthwhile to Avoid Prolonged Troubles

IN the course of his chairman's address to the Utilisation Section of the I.E.E. (reported in the ELECTRICAL TIMES last week), Mr D. B. Hogg (Imperial Chemical Industries) instanced some occurrences in which engineering investigation has produced a solution to breakdowns and the like, which if tackled by trial and error, would have given rise to considerable expenditure. Since most of these solutions have an interest for many maintenance engineers, they are noted here.

Effects of "Arcing" on Alloy Steel

High-pressure gas for the production of a special material is conveyed in 13% chromium-steel pipes and is heated electrically by passing heavy electric currents through the pipes which are of appreciable resistance. Brass clamps are used to attach the supply cables. During routine examination of one of these pipes, "craters" were found; these were points where arcing had occurred between the brass clamps and the pipes. Although these craters appeared to be only superficial damage and were, therefore, at first disregarded by the operating staff, examination by the research department showed that the damage can be extremely serious. The extensive cracking in this case was due (*a*) to inter-crystalline penetration of the alloy steel by molten brass, and (*b*) to thermal hardening.

The immediate action taken was the replacement of the brass clamps by steel ones together with thorough and regular inspection to ensure that the electrode clamps were in intimate contact with the pipes.

Similar cracking was also found in a low-alloy steel component where arcing had occurred between a copper electrode and the component.

Renewing Shafts by Metal Spraying

The slight wear experienced occasionally on motor shafts can be rectified by special metal spraying. Normally the surface to be sprayed has either to be shot blasted or severely roughened in order to key the sprayed metal to the base, and frequently the results are not satisfactory owing to lack of adequate adhesion. Recent work by the materials research section of one firm shows that ordinary machined surfaces on shafts can be built up satisfactorily by metal spraying if a thin sprayed coat of molybdenum is first applied, the final thickness required being obtained by spraying a metal such as nickel on top of the molybdenum. It is claimed that some alloying takes place between the molybdenum and the steel surface, giving superior adhesion compared with previous spraying techniques.

Failure of Heating Element

A new nickel-alloy-wire heating element failed shortly after it was installed in service, and it was essential to know whether the failure was due to mechanical reasons or fusion. The microstructure of a longitudinal section of the wire after suitable polishing and etching revealed under the microscope conclusive proof that fusion was the cause of failure. This was shown by the fact that partial or complete fusion of the nickel-rich solid solution, followed by fairly rapid cooling (as would be the case in a wire element) produces a structural change which is easily visible.

Cracking of Brass Armouring

Parts of the high-zinc-content (65:35) brass armouring on a gas-pressurized cable had cracked after exposure to salt water following local damage of the outer rubber sheathing. Examination showed the cracking to be due to stress corrosion, the type of cracking being intercrystalline. Experiments in the laboratory indicated that the *applied* stresses produced in the brass by the internal pressure of the gas in the cable were probably more responsible for the stress-component part of the mechanism than the *internal* stresses in the cold-rolled brass-strip armouring. The corrodent was, of course, the small amount of salt water admitted by the damaged sheath.

It is known that high-zinc-content brasses are very susceptible to stress corrosion and some material far less susceptible was obviously desirable. The material successfully used as a replacement was 90:10 copper-zinc brass, the higher copper content giving increased resistance to stress corrosion.

FIXING WORKSHOP SIZE

MAINTENANCE organisation in the coal mining industry in this country is now being organised in many respects. Amongst the steps being taken is the centralising of heavy maintenance in Area workshops. This still leaves an appreciable amount of "first aid" repairs and preventive maintenance to be carried out at collieries, and the production department of the N.C.B. has recently issued an information bulletin (No. 55/148) which gives guiding principles on what should be provided at this level.

Most of the recommendations made have special application to coal mining but several of them have some interest for other industries. Particularly is this so regarding the arrangement of work spaces within the workshops to minimise handling of materials and of the equipment needing repair or other attention. Three types of layout are considered as suitable for most requirements, and these are sketched out in the bulletin. (They are designated angle, parallel and linear.) The size of workshop considered necessary in relation to coal output is indicated in Table I. The bulletin also presents estimates of the equipment desirable for the various sizes of workshop. All the workshops are provided with electrical sections, but it is interesting to note that these have no machine tools of their own. They consist of work benches only, together with a test panel for completed jobs. Presumably they use the machine tools of the general mechanical section.

An appendix to the bulletin which may attract wide interest deals with lubricating oil storage and dispensing. A key point in the suggested scheme is the identification of the various grades of oil by means of colours on all pumps, storage tanks, etc. All oil storage tanks and dispensing points are to be metered. It should be noted that the colour scheme extends right down to machines. Oil points are painted in accordance with the tank colour of the oil with which they are to be replenished.

It is suggested in the bulletin that this symbol system could be extended to other aspects of the lubrication system. A square painted symbol around the oiling point might indicate daily oiling, a diamond symbol weekly oiling, etc.

TABLE I.—RELATIONSHIP OF FLOOR AREAS TO COAL OUTPUT

Output of Coal in Tons per day	Floor Areas in Square Feet				
	Workshops	Stores	Carpenters' shop	Offices etc.	Total
Up to 1000	2400	900	575	350	4225
1001 to 2000	3750	1425	600	350	6125
				750	6525
2001 to 3000	5250	2300	600	750	8900
3001 to 4000	7200	3000	750	1000	11950
4001 to 5000	8100	3750	900	1350	14100

POWER SUPPLY

Statistics for September

THE end of the quarter usually sees a considerable amount of new plant commissioned by the C.E.A., and last month proved no exception. The September record was impressive, some 323 MW of turbine plant and 1,765 klb/hr evaporative capacity of boilers being brought into commission.

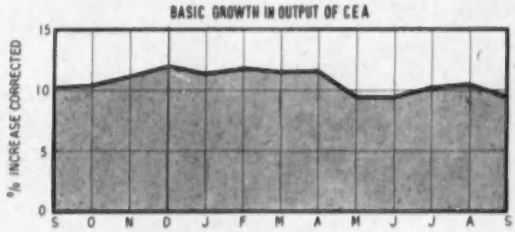
London Division's generating capacity increased by the 30 MW of a further set at Acton Lane B, this being a Richardson's, Westgarth unit. The same manufacturer is also responsible for the .52·5 MW set commissioned at Brighton B, in the South Eastern Division. Also in this division comes a 360 lb/hr boiler by International Combustion at Littlebrook C power station, the seventh such unit for the station. In the Eastern Division, Goldington records the commissioning of its second generating pair—a 30 MW B.T.H. turbo-alternator and 300 klb/hr. Clarke, Chapman boiler, the latter providing steam at 600 lb/sq in., 850° F at the t.s.v. The neighbouring East Midlands Division increases its generating capacity by a 60 MW English Electric set and a 575 klb/hr International Combustion boiler at Drakelow A. This station, opened last Friday, is described more fully on page 623 of this issue. Carmarthen Bay, South Wales Division, records a further pair, a 60 MW set by Metropolitan-Vickers (the fifth to be commissioned), coupled with the tenth Babcock and Wilcox 240 klb/hr boiler.

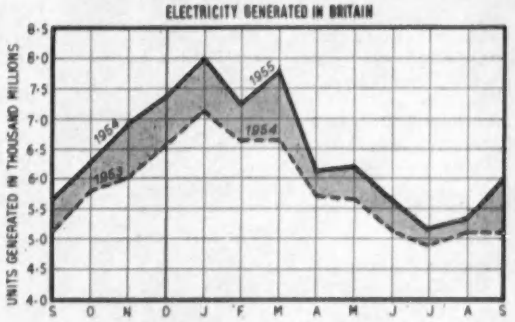
It is the North West, Merseyside and North Wales Division which benefits most from the September total, four stations in all recording new plant. Clarence Dock sees its third boiler, a 350 klb/hr unit by Babcock and Wilcox. This joins two 51·5 MW sets which generate at 33 kV and have t.s.v. steam conditions of 600 lb/sq in., 800° F. The fourth 30 MW turbo-alternator, a Parsons unit, brings Connah's Quay nearer its full complement of six sets. Following the commissioning there of the second boiler in August comes the second set at Fleetwood, this being a 30 MW, English Electric machine. To complete the list is Huncoat, with its third G.E.C. 60 MW set.

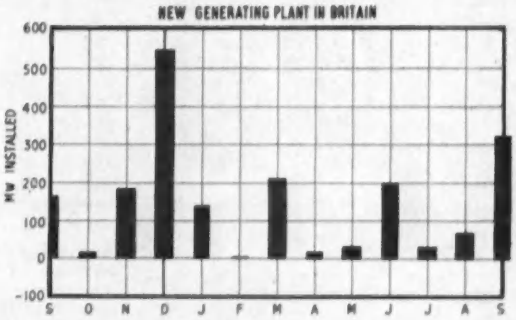
ELECTRICITY BOARD AND C.E.A. SALES IN SEPTEMBER

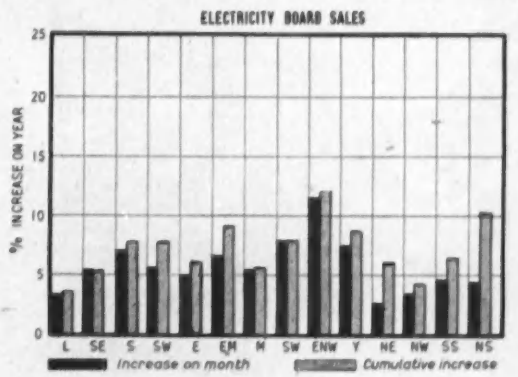
Board	September Sales in million units	%age inc. on Sept. 1954
London	437·1	3·2
South Eastern	280·1	5·4
Southern	347·2	7·0
South Western	182·4	5·6
Eastern	468·2	5·0
East Midlands	422·0	6·6
Midlands	554·0	5·4
South Wales	351·7	7·9
Merseyside and North Wales ...	345·5	11·3
Yorkshire	562·6	7·4
North Eastern	329·2	2·7
North Western	593·8	3·4
Direct Sales by C.E.A.	149·3	36·1
C.E.A. Grand Total	5,023·1	6·5
South of Scotland	396·8	4·5
North of Scotland	87·3	4·3

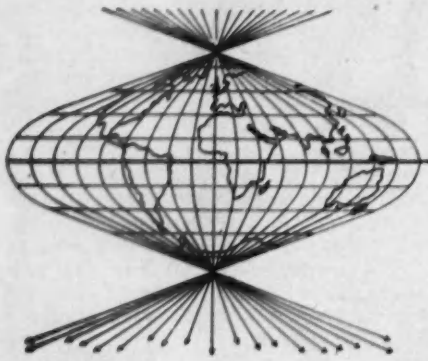
Sales of energy in September continued their steady climb, most of the increases recorded lying between 5 and 10%, the increase in total C.E.A. sales being 6·5%. Temperatures, however, were somewhat higher this year than last although the number of effective working days remained unchanged, and when allowance for this factor is made, the basic growth in load is seen to be 9·6%. Looking at the coal position, it is seen that, due to the warm summer, power station stocks are the highest they have been for some years: 6·63 million tons at the end of September, some 0·68 million tons higher than those at the corresponding time last year. Due to increased consumption, this total represents, however, only a little increase in the effective stocks, being equivalent to 6.4 winter weeks consumption, as against 6·1 for the previous year.











OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

B.C. Tenders

For the supply and installation of two turbines and penstock valves at the Upper Campbell Lake project of the British Columbia Power Commission, the Dominion Engineering Co., of Quebec, has submitted the lowest tender of $964,803. The Allis-Chalmers Co. quoted $1,005,535, and the Vancouver Iron Works $986,863. On an alternative two stage contract for one turbine and one penstock valve Allis-Chalmers quoted $513,042, Vancouver Iron Works $517,802 and Dominion Engineering Co., $523,530. The second stage of the contract giving a six-month option for the second turbine and penstock valve brought bids of $469,054 from Vancouver Iron Works, $481,131 from Dominion Engineering, and $495,292 from Allis-Chalmers.

Expansion Plan

Along with the $5 million expansion programme of Bowater's Newfoundland Pulp and Paper Mills Ltd., an additional 10,000 kVA of plant is likely to be installed at the Corner Brook station of the Bowater Power Co., it has been stated. As we reported on 21 July, the existing station at Corner Brook has an installed capacity of 150,000 h.p., but there is ample additional power potential available.

Quick Delivery

Shipment of the first of four 138 MW waterwheel generators for the Bersimis River power project, Quebec, has been begun by the Metropolitan-Vickers Electrical Co. The generators are being shipped in pieces and erected on site by Metropolitan-Vickers. The first two sets are scheduled for commissioning by the end of 1956.

Aluminium Plant

The British Aluminium Co. plans to build a $130 million primary aluminium producing plant at Baie Comeau on the north shore of the St. Lawrence River 200 miles east of Quebec, according to Mr M. Duplessis, the Premier of Quebec. This will involve hydro-electric developments on the Manicouagan and Outardes Rivers, in addition to increasing the Bersimis River power project to its full capacity of 1,750,000 h.p. The initial hydro-electric developments are estimated to cost about $20 millions. The aluminium plant will have an ultimate capacity of 320 millions tons of ingots annually. The first stage of construction, to cost $40 millions, is scheduled to be complete by 1957, the second by 1959, the third by 1960, and the entire plant by 1965, it is stated.

NICARAGUA

Station Plant

The Kuljian Corporation of Philadelphia has been engaged by Empresa Nacional de Luz y Fuerza, Managua, Nicaragua, for the design, engineering, procurement of materials and equipment, inspection of construction and initial operation of a 30,000 kW thermal power plant. The Empresa Nacional de Luz y Fuerza of Managua is an autonomous government-owned corporation which supplies power to the Managua area. To be built in Managua, the nation's capital, this plant will double the electric generating capacity in Nicaragua. The awarding of the contract to the Kuljian firm is notable in that it marks the transition of Nicaragua's power industry from the phase of scattered diesel plants to that of an organised power network with facilities capable of satisfying an expanding market. The equipment involved comprises two 15,000 kW turbo-generators, and two 160,000 lb/hr oil-fired boilers complete with all auxiliaries. The Nicaraguan economy has been actively expanding in recent years with a consequent rise in the demand for power, especially in Managua and the surrounding area. Generating and distributing facilities have not been able to keep pace with this increased demand, and many industrial and commercial establishments have installed their own diesel power units.

SCANDINAVIA

Power Export

The Norwegian Government is to ask Parliament to approve the scheme for the export of power to Sweden, to which we referred on 9 June. This involves the construction of a hydro-electric station at Ovre Nea, in the Trondheim area, which is to have an annual output of about 600 million units, of which 330 million units will be exported to Stockholm, Sweden. The power station is to be built, owned and operated by the city of Trondheim, and is to be financed largely by a loan of about £4½ millions to be raised in Sweden. The price per unit to be paid by Stockholm under the sliding scale agreed by the authorities will vary from a maximum of 2·9 Swedish ore (equivalent to just under ½d.) in winter, to half that amount in summer.

AFRICA

Shire Valley—First Step

Work is to begin immediately on the initial step of the first phase of the Shire Valley irrigation and power scheme, the Federal Government of Rhodesia and Nyasaland has announced. This involves the construction of a seasonal bund at Liwonde to block the outflow from Lake Nyasa. We reported on 15 Sept. that unless such a temporary barrage was soon erected the level of the lake might drop so far as to prevent carrying out any part of the project. Sir William Halcrow and Partners, consulting engineers who prepared a report on the scheme, recommended that this first step should be followed by the erection of a barrage and a power station at Matope, 35 miles from Blantyre.

Kariba Line

An indication that the Federal Hydro-Electric Board of Rhodesia and Nyasaland is pressing ahead with plans for the Kariba Gorge power scheme, is the call for tenders for the transmission line advertised in this issue. This work involves the construction of about 900 miles of 330 kV s.c. steel tower transmission lines using s.c.a. conductors, span lengths being about 1,100 ft.

S.W. ASIA

Progress in Hyderabad

Electricity supply projects in Hyderabad were recently reviewed by a Government spokesman. First stage of the Nizamsagar project had been completed and the other two would be complete by the end of the year. The erection of 33 kV transmission line from Erragndda substation to Hussainsagar was in its final stages. Looking more to the future, it was stated that orders for machinery and the erection of transmission lines in the Tungabhadra hydro-electric scheme would be placed soon. The Government

had undertaken the electrification of 17 towns and villages, and a sum of Rs.29 lakhs had been allotted for replacing plant which was wearing out at various power stations. In addition a scheme for electrifying Vikarabad and the establishment of a power station had been sanctioned.

Return for Undertakings

Endeavouring to meet demands of the electricity supply companies for a more reasonable return than is at present allowed under the Electricity Supply Act, the Government of India has introduced an Amendment Bill which fixes the return at 2% above the bank rate. But the figure has disappointed the industry, who were seeking at least 2½%, we understand. The Bill contains a number of other provisions, although again, these do not seem to fall completely in line with what the undertakings have sought. Discussions during the Select Committee's consideration of the Bill are likely to be lengthy.

A.C. Supplies for All

Madras Electricity Dept. is to extend a.c. supplies to all consumers in the city. At present power is supplied through a complicated network of d.c. and a.c. mains, but the former has served its useful and economic life, it is stated. Consumers are being asked to co-operate and change over to a.c. as and when the occasion warrants without waiting for the d.c. supply to fail.

AUSTRALIA

Sydney's Good Year

An increase of 11·6% in units sold, and a surplus on the year's operations of £850,216 is the very satisfactory result of activities of the Sydney County Council's electricity undertaking during its jubilee year—1954. The undertaking was originally operated by the Municipal Council of Sydney, but ownership passed to the County Council on 1 Jan., 1936, embracing a much wider area of supply. It is of interest to note that total sales in 1935 amounted to 461·3 million units, while for 1954 the figure was 1,442·7 millions. The Council is now concerned only with distribution, responsibility for power generation resting with the N.S.W. Electricity Commission. In the report for 1954, Mr C. E. Ranger, general manager of the council's undertaking, states that industrial consumption increased by 14½% and commercial sales by 16% indicative of the buoyancy in trading. Sales of apparatus also increased sharply —cookers by 28½%, storage water heaters by 13%, 1½ gal water heaters by 42%, and refrigerators by 10½%. On the technical development side, experiments have been carried out with p.v.c. cables in place of p.i.l.c. cables, providing a saving of 50% in cost. Finally, the Council has this year instituted a block tariff for domestic consumers which will save the latter £380,000 a year, it is estimated. The undertaking hopes to occupy a new Central Store at Epsom Rd next year.

Rural Electrification Programme

The final phase of Victoria's rural electrification was ahead of schedule on the 10-year plan introduced in 1951, even though it has been necessary in recent months to slow down this work at a rate consistent with the available finance. This information was given in the N.S.W. Legislative Assembly recently by the Minister of Electrical Undertakings, Mr J. S. Bloomfield, when replying to a question as to whether the State Electricity Commission intended to restrict extensions in rural areas. The Government were discussing the financial aspect with the Commission in an endeavour to maintain the planned rate of progress. The programme up to early next year would go on. Meanwhile the Commission was canvassing for prospective consumers willing to lend half the capital cost involved in extensions.

Development Planned

An expansion programme throughout Australia, estimated to cost £1,000,000, is planned by the General Electric Co., Ltd., of England, Mr T. E. Morgan, chairman of the Australian concern, stated on his return to Sydney last week from a business trip to Britain. He said the expansion programme had already been started and would extend over the next two years. It would include extensions to the company's two factories in Australia.

NEW ZEALAND

New Station Contracts

Contracts have now been placed for plant for the 180 MW steam power station to be erected at Mercer, North Island, for the N.Z. State Hydro-Electric Board—the station which is urgently required to meet North Island's power demands. The Metropolitan-Vickers Electrical Export Co. and the English Electric Co. are each to supply three 30 MW turbo-alternator sets, while the contract for six 300 klb/hr boilers, valued at nearly £2m, has been placed with Babcock and Wilcox Ltd. Steam conditions for the pulverised fuel fired boilers will be 635 p.s.i., 865° F, burning Maramarua open-cast or Huntly coal. Two-thirds of the 600,000 tons of coal needed annually will be delivered from the adjacent Maramarua coalfield by overhead ropeway. To expedite construction work, the station will be of the semi-outdoor type, with a canopy roof over the boilers. Announcing the placing of the contracts last week, Mr Goosman, Minister in charge of the State Hydro-Electric Department, said two 60 MW sets were scheduled for commissioning by Sept. 1958. Consulting engineers for the project are Preece, Cardew and Rider, and the civil engineering consultants, Alexander Gibb and Partners, both of London. The value of these latest English Electric Co. and Metropolitan-Vickers' contracts is over £800,000 each.

FAR EAST

Supply for Lantao

Work on a $1,000,000 project by the China Light and Power Co. to supply Lantao Island with electrical light and power, to which we briefly referred last week, will begin in the near future, says Mr C. F. Wood, manager of the China Light and Power Co. Power will be supplied from the company's main station and will be relayed to Lantao by means of a submarine cable.

The only power obtainable on Lantao at present comes from a small company operating in Tai O, and several small private generators. The Tai O Electric Co. has been taken over by the China Light and Power Co.

The new generating station recently inaugurated at Swift Current, by the Saskatchewan Power Corporation, feeds into an extensive rural network serving nearly 1,000 farms, in addition to supplying several oil and gas fields in south-west Saskatchewan, through a new 72 kV transmission line. Of strikingly modern architectural design, as our illustration alongside shows, the station now has an output capacity of 5,500 kW, but is shortly to be increased. Installed are two British-made National 1,600 h.p. gas diesel engines each coupled to a 1,250 kW Brush alternator, and one 4,240 h.p. Cooper-Bessemer gas diesel engine driving a 3,000 kW Canadian Westinghouse generator. Another set similar to the latter is to be installed next Spring. Set up in 1929, the Saskatchewan Power Corporation has extended its facilities tremendously, particularly since the Rural Electrification Act was passed in 1949.

Personalities

IN THE INDUSTRY

Mr D. M. McKechnie has been elected a director of the Baghdad Light and Power Co., Ltd. He has been general manager of the undertaking for the past ten years.

In charge of electrical engineering at the University College, Swansea, until a few months ago, **Mr David Cass-Beggs,** M.SC. TECH., M.I.E.E., has been appointed general manager of the Saskatchewan Power Corporation. He has served as a consultant to the Corporation for nearly nine years. From 1939 to 1953 he was associate professor of electrical engineering with the University of Toronto, Ontario, after which he was at University College, Swansea. Born in England, Mr Cass-Beggs went to Canada in 1939—he and his family were among the survivors of the torpedoed *Athenia*. During the last war he developed for the R.C.A.F. what is claimed to be the first automatically controlled human centrifuge, which was later extensively used by the Allies. While with the University of Toronto, he also acted as a consultant to the Power Corporation in hydro-electric and natural gas development in the province. He made a study of the power potential of the proposed South Saskatchewan river dam for the P.F.R.A. in 1948, and served as a consulting engineer for the Provincial Government. His work involved surveying the possibility of rural electrification programme and investigating future power needs.

At the Brazilian Embassy recently the Ambassador, H.E. S. de Souza-Leao Gracie invested **Sir Ivor Cox,** D.S.O., M.I.MECH.E., A.M.INST.C.E., with the decoration of the Order of the Southern Cross of Brazil. This was conferred upon Sir Ivor, who is chairman of Metropolitan-Vickers Electrical Export Co., Ltd., and managing director of A.E.I. Overseas Ltd., by the President of the Republic of Brazil earlier this year for services rendered to Brazil, with particular reference to the electrification of the Brazilian Railways. At the time Dr I. R. Cox, as he then was, became a director of the Metropolitan-Vickers Electrical Export Co., Ltd., in 1935, work was in progress on the suburban electrification service of the Central Railway of Brazil, which was inaugurated by President Getulio Vargas in 1937. Met.-Vickers have now installed a factory in Brazil to meet increasing demands from Brazilian Railways. The new factory deals with the repair of all the electric equipment for both suburban trains and electric and diesel locos.

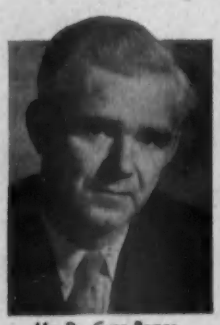
Now in this country on an extended visit is **Mr F. Sykes,** who is acting as a technical liaison engineer to the Electricity Commission of New South Wales. Mr Sykes is visiting various installations and works, obtaining information on technical developments of interest to the Commission. He expects to return to Australia next Jan.

General manager of Murex Welding Processes Ltd., **Mr J. M. Willey,** A.M.I.E.E., M.INST.W., has been appointed to the board of directors of the company.

Retiring at the end of this month from the position of generation engineer (construction) to the London Division, C.E.A., is **Mr Robert Illingworth,** O.B.E., M.I.E.E., M.I.MECH.E., who many will associate with the Brunswick Wharf power station, commissioned last year, for the conception of which he was largely responsible. In fact, Mr Illingworth has become very well known for his association with Poplar—he was chief electrical engineer and general manager of the Borough Council's undertaking from 1932 until vesting day during which time he was responsible for many improvements and developments, including a phenomenal expansion of the cooker load. Mr Illingworth began his career with tramways in Blackpool in 1906, going to Oldham four years later as switchboard engineer with the Corporation undertaking. He then went to Middleton, near Manchester, as charge engineer, and after three years proceeded to Accrington. Subsequently he was engineer to Palmer's Shipbuilding and Iron Co. at Jarrow till 1920 when he went to South Wales where as chief electrical engineer to Cory Bros and Co., he was responsible for the erection of two power stations and many miles of transmission lines over difficult mountainous country. In 1929 he was appointed deputy electrical engineer and manager at Plymouth and after 3 years joined Poplar in a similar capacity, where after nearly a year he became chief. A man of friendly disposition, Mr Illingworth has numerous friends throughout the Industry. He was the recipient of presentations at a dinner given in his honour by colleagues of the London Division last Friday.

The four Area Board chairmen now serving on the Central Electricity Authority are due to leave that appointment on 31 Dec. next. They are **Mr H. J. Randall** (London Board), **Mr W. S. Lewis** (Midlands Board), **Mr D. Bellamy** (Yorkshire Board) and **Sir Joseph Hailsworth** (North Western Board). The Minister of Fuel and Power has now appointed the following four Area Board chairmen to succeed them on the Authority from 1 Jan.: **Mr Norman Elliott,** O.B.E., M.A., J.P., M.INST.C.E., M.I.E.E. (chairman, South Eastern Electricity Board); **Mr C. R. King,** C.B.E., M.INST.F., COMP.I.E.E. (chairman, East Midlands Electricity Board); **Mr L. Howles,** C.B.E., M.I.E.E., M.INST.STRUCT.E., F.R.S.A. (Chairman, South Wales Electricity Board) and **Mr D. H. Kendon,** B.SC.(ENG.), M.I.E.E., M.I.MECH.E. (chairman, Merseyside and North Wales Electricity Board).

The Metropolitan-Vickers Electrical Co., Ltd., has appointed **Mr A. E. Andrew,** A.M.I.PROD.E., as superintendent of the Main Production Department, in succession to **Mr A. J. Leslie,** who will continue to assist the director of manufacture on special problems. Mr Andrew went to Metropolitan-Vickers as a special trainee in 1936, and subsequently joined the Main Department Production staff. During the war, besides being concerned with contracts for turbo-



Mr D. Cass-Beggs

Sir Ivor Cox

Mr R. Illingworth

Mr A. E. Andrew

generating plant, he had a special responsibility in connection with the manufacture of mobile power stations. He was appointed assistant superintendent, Main Production Department, in 1948, since when he has dealt with the main generating plant manufactured by the company for power stations at home and abroad.

Previously service and spare parts manager with J. and H. McLaren Ltd., **Mr Norman Lee** has been appointed service manager of the British Materials Handling Division of the Yale and Towne Manufacturing Co., Ltd.

Mr W. Strath, C.B., at present serving as a third secretary in H.M. Treasury, has been appointed a full-time member of the Atomic Energy Authority. Further part-time members of the A.E.A. are **Sir Rowland Smith** (chairman of Ford Motor Co.) and **Mr C. F. Kearton** (a director of Courtaulds Ltd.). Mr Kearton is also a member of the Electricity Supply Research Council.

Mr E. K. Cole, chairman and managing director of E. K. Cole Ltd., recently presented long-service awards to fourteen members of the staff to commemorate their 25 years service with the company.

Brigadier D. H. Bond, C.B.E., M.V.O., A.M.I.MECH.E., has been appointed mechanical and electrical engineer and stores officer, British Transport Waterways headquarters staff, and will be located at Birmingham. Previously he was divisional stores officer, Midland Division, British Road Services.

Previously turbine specialist engineer at Loughborough, **Mr R. D. Taylor** has now taken up duties as London branch manager to the Brush Electrical Engineering Co., Ltd. Other changes in the company's home sales staff includes the appointment of **Mr G. M. Ingram** as manager of the Sheffield branch office (he was formerly manager of the Ipswich office and more recently represented the company in Iran). The new manager of the Ipswich branch office is **Mr D. P. Engert** who was previously at the London branch office and was more recently engaged on special duties at Loughborough.

At a luncheon following the meeting of the South Western Electricity Consumers' Council last Friday, farewell gifts were presented to **Mr S. F. Steward,** C.B.E., M.I.PROD.E., chairman of the South Western Electricity Board, and to his wife, by Lady Carew Pole and Mrs F. H. Hayman. Tribute was paid to Mr Steward's leadership of the Board in its first 7½ years of operations, which had proved so remarkably successful.

At the Academic ceremony which terminated the centenary celebrations of the Federal Institute of Technology in Zurich on Saturday last, the Honorary Degree of Doctor of Technical Science was conferred on **Dr Willis Jackson,** F.R.S., director of research and education, Metropolitan-Vickers Electrical Co., Ltd. Dr Willis Jackson spoke in reply for all the recipients at the ceremony.

Mr A. E. Potton, who recently retired from the General Electric Co., Ltd., at the age of 64, had been with the company for 46 years. He joined the head office in 1909, and after working for 15 years in the Osram Department and the Bells and Telephones Department, he moved to Cardiff branch where he was responsible for radio, valves, bells, telephones and mines signalling equipment. He was also secretary of the G.E.C. Social and Athletic Club in the West of England. In 1935 he returned to London where, for the past twenty years, he had been responsible for the section of the Radio Department which deals with batteries and torches.

Mr H. Davies, A.M.I.E.E., has been appointed manager of the Southport District of the Merseyside and North Wales Electricity Board. He succeeds **Mr W. T. Gann,** M.B.E., M.I.E.E., who retired on 30 Sept. Mr Davies, at present senior development assistant with the Board's No. 1 sub-area headquarters, Liverpool, will assume his new appointment on 1 Nov. A native of Chester, Mr Davies has had 30 years' experience in the Electricity Industry. He entered the service of the Chester Corporation Electricity Department in 1925, and in 1932 was appointed sales manager with the Barnsley Corporation Electricity Department. In 1935 he moved to the Heston and Isleworth undertaking as sales engineer, and two years later became consumers' engineer with the Bedford Corporation undertaking. In 1947 Mr Davies was appointed commercial officer with the Cheltenham Corporation undertaking which on Vesting Day was absorbed into the Midlands Electricity Board. He joined the Merseyside and North Wales Board in 1950.

Mr Edward Jones, M.I.E.E., M.I.MECH.E., formerly deputy chairman of the South Wales Electricity Board, who is convalescing at his home, is progressing very well we are pleased to hear.

Chairman of the board of Canadian General Electric Co., **Mr H. M. Turner,** has been elected president of the Canadian Electrical Manufacturers' Association.

District manager at Castleford to the Yorkshire Electricity Board since 1948, **Mr E. S. Prior** is to retire early next year, we learn. Mr Prior started his career in the industry with the Chelmsford Electric Lighting Co. in 1906 and gained further experience with the Harrogate Corporation undertaking before joining the Yorkshire Electric Power Co. in 1911, with whom he served in various capacities until 1948, ultimately as district engineer at Castleford.

OBITUARY

Mr A. H. Lloyd, director of design to Alfred Herbert Ltd., died recently, aged 70.

Mr H. Wood, B.A.(OXON.), M.I.E.E., manager of the Radio and Television Department of Ferranti Ltd. at Moston, died on 9 Oct., aged 41. He joined the staff of Ferranti's Radio Laboratory in Sept., 1936, and during the war was engaged upon radar development. He had been manager of the Radio and Television Department since 1949.

Mr A. S. Wild, secretary and director of Gothic Electrical Supplies Ltd., died on 13 Oct., aged 51. He joined that concern in 1934.

Mr P. Bird, assistant branch manager at Ross to the Midlands Electricity Board, died on 11 Oct., aged 58.

Mr T. W. Morris, electrical clerk of works with Sunderland Borough Engineer's Dept., died on 16 Oct., aged 62.

Mr W. G. Turner, M.INST.C.E., M.I.E.E., M.I.MECH.E., former manager of No. 3 Portsmouth sub-area of the Southern Electricity Board, died on 17 Oct., aged 71. He retired in Feb., 1950, and prior to nationalisation of the industry was borough electrical engineer at Southampton for 28 years. A Londoner, Mr Turner served his apprenticeship with C. A. Parsons and Co., Ltd., and afterwards joined the Newcastle and District Electric Lighting Co. with whom he later became chief assistant engineer before going to Southampton in 1920. He was a past chairman of the Hampshire sub-area of the I.E.E.

Mr H. D. Wheeler, B.SC.(ENG.), chief engineer of Laurence, Scott and Electromotors Ltd., died on 17 Oct., aged 68. Mr Wheeler took his degree at Glasgow University, and was a pupil to the late Mr W. Marriott (then chief engineer to the M. & G. N. Railway). He joined Laurence, Scott and Co. as a test bed assistant in 1909, and soon found the right outlet for his abilities in mathematical studies and the analysis of electro-magnetic problems in the design of d.c. machines. Appointed chief d.c. designer in 1920 and chief engineer in 1944, he was largely responsible for the electrical development of a very wide range of machines, and in particular of the "Scott" electric cargo winches, and was joint patentee of a number of design and control features concerned with special speed and torque characteristics, for marine and industrial applications.

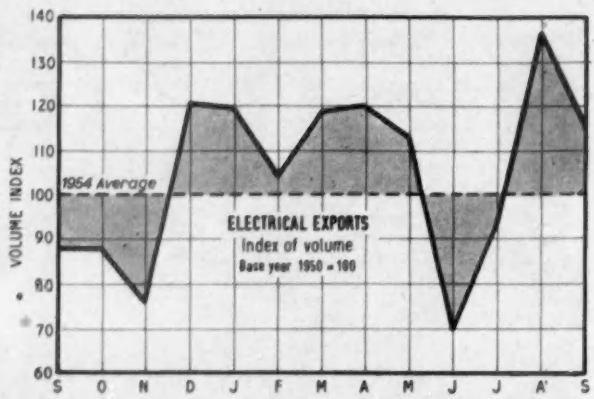
Mr G. J. A. Fuller, who died on 15 Oct., aged 84, was secretary of the Fuller Accumulator Co. at the original Bow works, and at the new works at Chadwell Heath where the business was transferred in 1915. He continued to act as secretary of the amalgamated Fullers United Electric Works, which was formed in 1920, and he retired before the war. Mr Fuller, the grandson of J. C. Fuller, who was prominent in the battery industry during the latter part of the last century, was the father of Mr L. H. Fuller, B.SC.(ENG.), M.I.E.E., construction engineer to the South Eastern Electricity Board.

Mr J. O. Bufton who operated an electrical engineering business in Llandridod Wells, died on 20 Oct., aged 68.

Mr W. H. Frost, managing director of W. H. Frost and Co., Ltd., engineers of Burnley, died on 22 Oct., aged 78.

EXPORTS and IMPORTS

Statistics for September



AFTER the phenomenal total of electrical equipment exported in August, the volume in September returned to a more normal figure, although, as shown in the graph of the ELECTRICAL TIMES Index of Volume, the level is still well above last year's average. In fact, the index for September now stands at 116, approximately the same position as that at May. The volume exported in September of this year is, moreover, considerably higher than in the corresponding month last year, for which the volume index was 89. All index figures are based on 1950 as 100.

In value, September's exports of electrical equipment amounted to £16,298,864. As in previous months, however, this total comprises exports of electrical goods, apparatus and machinery listed in Class D, Division 16 of the official accounts and hence does not include exports of domestic refrigerators and washing machines. When the value of these exports is added to the above total, the sum shown at the foot of the table below is obtained.

The reduction compared with the figures for August, was spread fairly evenly over most of the electrical goods with the exception of switchgear and switchboards, vacuum cleaners and certain other appliances. For switchgear of over 660 V, 200 A, last month's exports amounted to £1,187,191, an improvement on the previous month's good figure. Vacuum cleaner exports in September were valued at £152,899, compared with £83,725 during August. For floor polishers the corresponding figures were £121,261 and £99,477 respectively, while for hair clippers and dry shavers the September figure was £142,265, against £92,423 in August. Australia took electrical goods valued at £2,201,987.

Description	Exports value (£)			Imports value (£)	
	Sept. 1953	Sept. 1954	Sept. 1955	Sept. 1954	Sept. 1955
Generating Sets:					
Diesel up to 200 kW	294,525	248,239	274,652		
,, over 200 kW	172,928	312,466	477,103		
i.c. driven	14,620	9,352	26,724		
Steam turbine-driven	171,788	18,987	40,954	26,463	41,486
With other prime movers	94,819	73,112	53,865		
Generators	70,789	136,136	207,807		
,, parts	321,373	319,396	426,546		
Motors	808,965	743,133	832,235	31,938	64,228
Motor starters and controllers	188,740	157,207	193,718		
Convertors and rectifiers	106,453	83,995	95,895		
Transformers	895,659	722,404	1,095,934	174,820	130,380
Switchgear and Switchboards	1,094,916	1,076,718	1,470,634		
Batteries, primary and parts	161,856	300,739	336,236		
Fluorescent and Discharge lamps	55,580	61,997	66,939		
Other lamps	107,711	134,065	134,473		
Radio and Electronic gear	2,014,032	2,184,463	2,456,485	580,748	1,239,545
Telephone and Telegraph Plant	1,260,600	937,120	1,170,848		
Cooking Appliances and parts	107,100	209,847	201,087		
Space heaters	12,897	32,367	24,341		
Water heaters	21,171	16,378	36,494		
Other heaters and parts	127,647	136,576	183,670		
Welding machinery	75,386	70,178	72,310	9,741	9,585
Signalling and Bell equipment	81,944	33,970	71,889		
Commercial Instruments	124,981	163,259	141,583	57,464	37,323
House Service Meters	82,888	107,030	108,282		
Electro-medical and X-ray apparatus	100,174	106,109	134,428	35,430	60,418
Fans	105,291	95,864	95,687		
Vacuum Cleaners	133,240	150,518	152,899		
Other Appliances and parts	205,699	357,006	499,686		
Portable power tools	119,613	151,543	154,059		
Washing Machines up to 150 lb	323,825	209,586	260,761		
Power Refrigerators, up to 12 cu ft	526,738	492,531	426,373		
Telephone and Telegraph Cables	522,919	243,385	613,842		
Paper-insulated Cables	593,386	394,447	990,655		
Rubber-insulated Cables	285,626	358,175	379,273	10,222	39,756
Winding and similar wires	84,735	93,906	98,074		
Other Cables and Wires	175,511	182,740	259,133		
Accumulators and parts	273,218	295,612	456,878		
Insulating Materials	105,473	109,458	168,278		
Electrical Ware	60,679	48,730	94,983		
All other articles	2,333,498	1,642,561	2,000,285	466,946	587,596
Total	13,146,215	13,211,466	16,985,998	1,393,772	2,210,317

PROBLEMS AND PRACTICE

In Engineering

Reversed Winding

IN thanking E. A. Robbins for his observations on the above subject (15 Sept. issue), I must also disappoint him since his suggestion that the connections to series and shunt windings were reversed was not the case. In fact, the starter connections were standard and correct in every way apart from the reversal of the series winding. Referring to the diagram, when the fault was discovered *A* was connected to *b*, and *a* to the brush, thus causing the n.v.r. to overheat: when the connections were corrected—*A* to *a*—the starter operated properly.

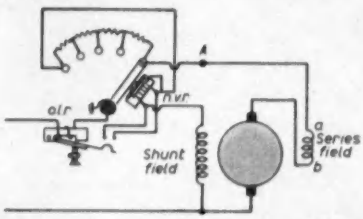


Diagram of starter and motor connections, which, with a and b reversed, resulted in an overheated n.v.r.

It is clear that in the reversed condition the motor was acting as a series opposed compound motor, the consequent weakening of the main field causing the motor to speed up and the armature current to increase. Since the shunt circuit should remain virtually unaffected it is thus difficult to see why the n.v.r. came to overheat. Perhaps other readers may have a suitable explanation to offer.—*A. R.*

S.P. versus D.P. Switching

IN reply to Mr Snelson (13 Oct.) may I say that I am gratified that he agrees with some of the things I have said about the use of d.p. switches. The replacement of s.p. by d.p. switches is, of course, impracticable because of the alterations to the wiring which would be involved in existing installations. The substitution, one may be sure, will not be made in the future either, the reason for the use of s.p. switches in the past being still uppermost in the future, namely expense. Sometimes safety to the user comes a poor second to cost when both are involved.

The insistence on such things as the regulation spacing of cleats, sizes of cables calculated by the use of arbitrary diversity factors, number of cables in a conduit, etc., are, I repeat, sheer humbug when all the electrical fraternity well know that the use of s.p. switches, about which nothing is mentioned even to the coroners, involves risks which could be removed by the use of d.p. switches.

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

The views of voyagers who, during the voyage had admired the "regulation" flag at the masthead, found too late as they sank beneath the waves that the captain had kept the secret that the ship was unseaworthy to himself, might well be excused. There is no excuse for those who hide from their potential victims the fact that s.p. switches are used only because they are cheaper than the d.p. ones, and that the use of the latter would have saved lives and avoided injuries.—*R. A.*

* * *

MR SNELSON says that the only practical approach to greater safety appears in laying down a standard of work and to maintain this statutorily by periodic examination and testing. Excellent, but how often could installations be tested? Even suppose this could be done every six months much could happen between one test and the next. The lines coming into a building can be crossed over from the outside at any time and for what other reason do I.E.E. regulations insist that a single phase installation is to be protected by a double pole switch? Surely because of the possibility of the neutral line becoming "live" to earth and if this is the case I consider that a fuse in the neutral is the next logical step—in short I ask "If a conductor must be switched why must it not be fused?" I admit that a neutral fuse might blow on its own for some reason and lead to the assumption that some appliance was "dead" just because it would not work. But I consider that the risk of a heavy load trying to complete its circuit through an unsuspected neutral —earth fault on one's installation is very much greater.—*"Ubique."*

* * *

I MUST admit being impressed by the force of many of T. H. Snelson's reasoned arguments. However, I think we can discount, at present, universal low voltage as being impracticable. Particularly in domestic circuits, where larger cable sections would lead to severe increases in wiring costs. I agree that everything must be done to improve the standard of workmanship and materials, but with the ever-greater flow of electrical appliances on the market, it is necessary to face up to the fact that the temptation for amateurs to carry out unauthorised extensions is well-nigh overwhelming.

Since appliances require socket-outlets for connection, the danger, which can even be caused by skilled operatives, lies in reversed polarity of switch-sockets with earthed apparatus bringing bare elements alive to earth with the switch off. I would suggest that a big step towards the solution is far from being beyond the realms of practibility. First, it should be made compulsory to fit d.p. switches on appliances; after all there are few complaints against the compulsory fitting of radio suppressors to motor-driven apparatus—failure to comply with would hardly lead to lethal results! Secondly, only d.p. switch-sockets should be permitted. This would require but simple manufacturing alterations and, if standard, should not make for any increase in costs as stocks would be simplified.—*M. N.*

* * *

HAVING this opportunity to reply, it is obvious that we are in agreement with many of each others views on d.p. switching, and in our concern for safety of installations and/or appliances.

How best to achieve this is the problem. Single pole switches rightly or wrongly are here to stay so far as old installations are concerned, and indeed there seems little hope of even making d.p. switching the rule for new, for the cost of the electrical work in a new house appears to be the first thing attacked should any price cutting be necessary by architect or builder. The evidence is all too clear when the one room—one socket —one lighting point is almost a rule for the smaller types of dwelling, with the result that amateur work and the use of multi-outlet adaptors is encouraged.

Consider, for example, the ordinary small living room with one socket-outlet provided to supply television and radio sets, standard lamp, vacuum cleaner, clock, and perhaps the occasional use of an electric fire. What is done, as we all know, is the purchase from the nearest chain store of a probably inferior type of multi socket adaptor, the trailing flexible cords being run under the carpet to the various points in the room.

Though a d.p. switch socket-outlet was installed a dangerous installation is then almost immediately brought into being. If d.p. switching or lower voltage is not practical, what is to be done? Nothing in this discussion has been said of the earthing problem, which just heaps a little more fuel to the fire. From this welter of problems no alternative but that of inspection and certification appears to offer any practical and immediate answer.—*T. H. Snelson.*

(This correspondence is closed.—Ed.)

Equipment for Industry

New Switch Plug Range

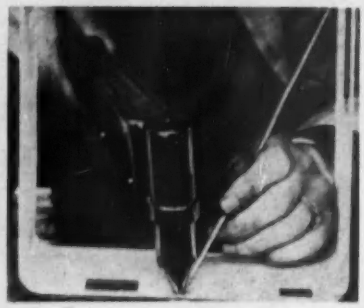
INSTALLATIONS possessing a number of different supply systems may be damaged by an appliance having a power plug permitting connection to an incorrect supply outlet. To reduce such accidental connections, the BRITISH CENTRAL ELECTRICAL CO., LTD., 6-8 Rosebery Ave, E.C.1, have produced an industrial switch plug which may have its contact centres specially placed to avoid any similarity between different power systems. A range of units are available from 8 to 124 amps and at the time of manufacture, by simple rotation of the plug and socket interiors, units specifically designed for differing supply systems are produced from the same basic components, but cannot afterwards be accidentally plugged into each other or interchanged. By this method, relatively inexpensive switch and plug units may be supplied to specific requirements for each different supply in the system.

Plugs up to 32 amp rating can have the spring contacts replaced in individual fuse units and each plug will only accommodate fuses of its own current rating, thus ensuring correct fusing of the appliance. Slight pressure on an insulated button actuates a spring-loaded pawl on the socket, instantly ejecting the plug and breaking the circuit; the plug remaining semi-captive. Robustly constructed and tapped in E.T. sizes suitable for wall mounting or bolting to distribution boxes, the units are fitted with a sprung waterproof shutter which seals the outlet socket when not in use.

Soldering Aluminium

ALTHOUGH aluminium has been known and used for at least a hundred years, soldering this metal still presents a problem. The ultrasonic method of soldering aluminium may be regarded as one of the successful systems developed in recent years but requires complex equipment to perform even the simplest soldering operation. In the past, simultaneous scratching the aluminium surface and applying tinning metal proved successful and also obviated the need for fluxes which so often corrodes and weakens completed joints.

Employing this earlier technique, a tool designed by BELARK TOOL AND STAMPING CO., LTD., 33 Sussex Place, W.2, is claimed to solder aluminium and its alloys quickly and efficiently. The tool mechanically cleans the oxide film from the aluminium surface by a steel brush vibrating in the centre of a heated solder bit. To prevent re-oxidisation of the cleaned area a pool of molten solder round the bit and brush excludes air and enables tinning to take place. Equipped with interchangeable solder-bits and brushes for either tinning open surfaces or inner faces and corners, the tool may be utilised as a conventional soldering iron for joining other metals to aluminium once a suitable tinned surface has been prepared. The copper bits are protected by nickel-chrome plate and due to the high operating temperature of 500° C, are mounted away from the vibrator to avoid conducted heat affecting this unit. A trigger



Belark's new aluminium soldering tool employs an original principle for soldering this metal

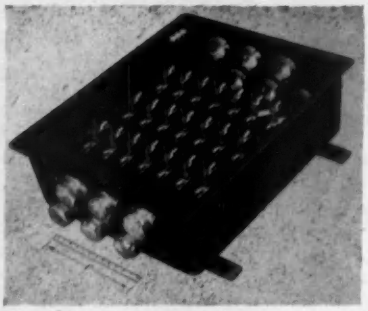
switch incorporated in the handle controls the vibrator actuating the brush, whilst the heating element is directly connected to the mains. The iron, rated at 165 W, operates only from an a.c. supply and requires blow pipe solder to effect a correct join to aluminium. The mechanical strength of joints produced by this method is comparable to that obtained with soft soldered joints in other metals. The tinning or soldering alloy recommended by the manufacturers of the tool, is Fry's LM aluminium solder having a low melting point approaching that of ordinary tin-lead solder.

Useful Transformer Catalogue

A SERIES of data sheets illustrating the standard ranges of transformers and chokes produced by WESTOOL LTD., St. Helen's Auckland, Co. Durham, have been recently made available. The data sheets provide dimensional details and include a comprehensive questionnaire enabling a full electrical description of the required transformer to be dispatched to the manufacturer. For three-phase transformers, a wide range of frame sizes has been designed including what is believed to be the smallest size available in this country. Although not indicated on the data sheets, these transformers may be enclosed or hermetically sealed.

Plastic Junction Box

THE properties of reinforced plastics recommend their use for a number of electrical applications, the latest being a junction box manufactured by UNIVERSAL METAL PRODUCTS LTD., Pendleton, Salford, Lancs. Produced from glass-fibre reinforced plastic having a high resistance to atmospheric corrosion, the box can be moulded by the preform matched metal moulding tool technique resulting in a smart finish. Fixing lugs and straps carrying the terminals are



This light weight junction box is constructed almost entirely from plastic

also made as glass fibre, polyester laminates. At present, only one type of junction box having an overall size 32 in. x 26 in. x 10 in. can be supplied.

Polystyrene Saves Weight

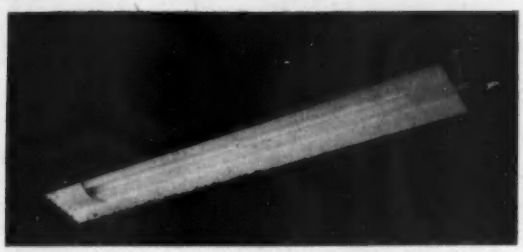
STYRON polystyrene has been available in the U.S. for a number of years, and DISTRENE LTD., Devonshire Hse, W.1, recently have opened a plant producing this material for the home market. Known as Styron 475 and 666, this thermoplastic is particularly suit-

An P.A.F. type aircraft battery moulded in Styron 475

able for lighting accessories, battery boxes and radio components where materials having strength and light weight coupled with the necessary electrical properties are required. By employing Styron 475 in the manufacture of 12V aircraft batteries, a weight-saving of 14 lb per battery has been achieved. Ventilator fan housings and instrument cabinets are typical uses for Styron 666, a general purpose polystyrene.

Eterna Shopwindow Lighting

SPECIALLY designed for shop window lighting, the new "Eterna" adjustable angle reflector is available for use with one, two or three 5 ft, 80 W tubes. The light angle is adjustable by fixing brackets provided at each end of the reflector. Separately housed control gear is required for the Angle reflector range of fittings which are finished in white stoved enamel.



The Eterna window fitting is adjustable by fixing brackets

ENSEL ELECTRIC CO., LTD., 218-219 Upper St, N.1, say that supplies are available from stock.

Araldite Adhesive for Retail Sale

THE production of "Araldite" epoxy resin adhesive in a form suitable for distribution through retail suppliers is announced by AERO RESEARCH LTD., Duxford, Cambridge.

Epoxy resins have been widely used in the aircraft industry as well as for casting, bonding and sealing electrical components and for protecting metal surfaces but now they are for general use.

The new "Araldite" pack contains two tubes, one of epoxy resin and the other of hardener which when mixed together provide a cold or warm setting adhesive capable of withstanding exposure to the elements, boiling water, and all common solvents. The adhesive itself contains no solvents and is, therefore, suited for bonding non-porous materials such as metal, glass and most plastics. It is equally suitable for repairing porcelain china and ceramics. Prices of the packs will be 6s. each retail.

For the Electrical Trade

Sleepwarm—Falk's new Blanket for the Winter

NEW addition to the Falk's range of electric blankets is the "Sleepwarm," a single heat model 50 in. x 30 in. supplied in pink or blue blanket material with matching satin binding.

FALK STADELMANN AND CO., LTD., 91 Farringdon Rd, London, E.C.1, tell us that the soft fleecy material is non-ignitable and that the asbestos covered element is securely held throughout its entire length by lock stitching. Two "Otter" type thermostats are incorporated for additional safety. The "Sleepwarm" is fitted with 9 ft of non-kink flexible cable and a d.p. on/off switch. It conforms to B.S. 2612, its loading is 100 W, and its price £5. 10s. plus £1. 0s. 1d. purchase tax.

Jackson re-enter Fire Market

Five new models out this season

RE-ENTRY to the electric fire market of the JACKSON ELECTRIC STOVE CO., LTD., of 143 Sloane St, London, S.W.1, is marked by the introduction of five most attractive models.

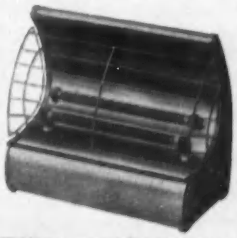
The 731J and 732J models are two inexpensive but first quality portable fires built to B.S.1670. Well balanced and attractive, these models have a highly polished reflector designed to give the widest possible distribution of radiant heat, mounted in a pressed steel body, with golden russet finish. The 2 kW version (732J) is fitted with a switch for half or full heat as required. Measuring 12 in. wide and 11¼ in. high, fitted with heavily plated guard and available for 230/240V range as standard or for other supplies as required, Model 731J costs £2. 12s. 6d. plus 19s. 3d. tax and 732J £3. 10s. plus £1. 5s. 8d.

Model 253J is an all-chrome fire with reflector and front of fire made in one piece, and set off by neat black feet and handle. This model is designed for 2 kW loading and has a switch to cut out one element if required. It measures 12¼ in. wide and 14¼ in. high and costs £4. 17s. 6d. plus £1. 15s. 8d. p. tax.

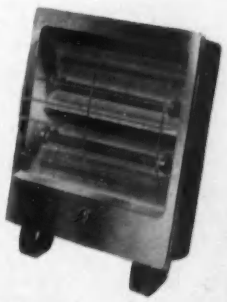
Model 251J is an inset fire in all-chromium which will blend well with all fire surrounds. It has a s.p. and a d.p. switch on the front thus allowing the use of either one or two 1 kW elements. This model is 12¼ in. square to fit into an opening 12 in. x 12 in. in the surround. It costs £4. 10s. plus £1. 12s. 11d. p. tax. Model 252J is a panel version with chromium reflector set in a mushroom coloured stove enamelled panel. Its special air flow convection system provides additional heat in the form of a warm current of air from an opening above the fire. Measuring 18 in. wide x 22½ in. high and for 2 kW loading, controllable to half or full loading, this model costs £5. 5s. plus £1. 18s. 5d.

Special feature of this model is that there is no need to cut away the wall to fit it. The fire is simply fixed to the wall by four concealed screws. All these new models are, of course, fitted with guards to comply with the relevant regulations.

Two popular models 731 J and 732 J are stylish inexpensive occasional fires



The 253 J fire shown on the right is an all chrome model with black feet and handle



An easy to fix outset fire is No. 252 J (left)

The inset version 251 J will blend with any decorative scheme

NEWS OF THE WEEK

National Inquiry into Fuel Efficiency

Ministry asks why there has not been Better Response

THE Ministry of Fuel and Power has asked for an investigation into the slowness with which firms are responding to the appeal for more efficiency in the use of fuel. A letter has been despatched to Regional Boards for Industry asking them to carry out an inquiry and report back. The letter poses two main questions: What are the factors at present preventing industry from making more efficient use of fuel, and how can they be overcome? and what action can be taken by the Government, either directly or indirectly, to encourage greater efficiency? A special company was established in 1953, called the National Industrial Fuel Efficiency Service, to advise industry on the more efficient use of fuel, and a spokesman of that organisation stated last week that there was plenty of room for improvement in industrial fuel installations. N.I.F.E.S.'s first report, issued last June, gave a more enthusiastic picture. As far as electrical interest is concerned the organisation's work lies in the field of combined generating and process steam plants, and progress there has been disappointing The Government loan scheme for industrial fuel saving equipment passed the £1 million mark last summer. Approval had then been given for loans for scheme to save 90,000 tons of coal a year.

Company Amalgamation

IN ORDER to improve their manufacturing facilities and to make room for further expansion, James Gordon and Co., Ltd., announce they have amalgamated with Hall Telephone Accessories Ltd. James Gordon are makers of automatic control equipment for boiler and steel furnace control, of reducing valves, Desuperheaters, CO_2 recorders, and of distance water level indicators, among other apparatus for industry. Coincidentally, Panellit Ltd., a subsidiary of Hall Telephones, have been formed to exploit exclusive licences of Panellit Inc., the well-known American concern.

Negotiations for Licence for Soil Treatment Process

IT WAS officially announced by British Insulated Callender's Cables Ltd. last week that they are negotiating for a non-exclusive licence for the U.K., for a Swedish soil treatment process (British Patent 657989) which, it is claimed, improves the conductivity of an earth electrode to earth. The method, which will however, be of limited use in this country, is expected to be superior to methods adopted previously in that the effects should last longer.

S. AFRICAN IMPORT CONTROLS REMAIN

IMPORT controls and hire purchase regulations are to remain as before in South Africa. Addressing the Congress of the Association of Chambers of Commerce, the Minister of Economic Affairs, Dr A. J. R. van Rhijn, said that import controls could not be removed before 1957, although relaxations might be made from time to time. This year's levels of imports are to be maintained during 1956, but the position is to be reviewed in the New Year. If additional funds became available, they would be used to remove shortages. As far as quotas for consumer goods are concerned, therefore, they are to remain at 33⅓% of 1948 imports. Dr van Rhijn advised merchants not to use up their quotas in the first half of the year. The Minister said that many merchants used up the whole of their 1955 quotas in the months before July.

The only alteration made in hire purchase rates concerned cars. The Minister stated that his action on possible tightening of hire purchase terms for other articles depended on an expert report. That report should be received at the end of this month.

Electrical Installations Essential in Countryside

IN THE present electrical age it was essential that large electrical installations be scattered about the country, said Mr G. C. Beedle, controller of the B.B.C.'s Western Region, when he addressed the annual rent audit dinner for tenants of the Duchy of Cornwall last week. Mr Beedle, describing the Corporation as a tenant of the Duchy, said he was interested to learn that someone else was running into similar difficulties as the B.B.C. in wanting to erect a mast on Dartmoor. The B.B.C. had considerable difficulty in securing permission to build their TV mast at North Hessary Tor.

He said it was quite unavoidable not to have large electrical installations if people wanted to be defended from an enemy; if they wanted a telephone; or if they wanted electrical power in their homes. Mr Beedle refrained from expressing an opinion on whether the installations were beautiful or not. Many of them, he said, would have to be in conspicuous positions, and would have to be tolerated. He went on to say that he did not mean to imply that installation should be carried out without a full sense of responsibility. Those involved were well aware of the need to preserve, as far as possible, the amenities and beauties of the countryside.

GLASGOW TROLLEYBUS ORDERS

CONTRACTS valued at over £620,000 are being suggested to Glasgow Corp. to replace obsolete tramcars on routes to be converted to motor- or trolleybus operation, and to provide new routes. It is proposed to add 150 motor buses and 80 trolleybuses to the transport undertaking's fleet of vehicles. The Corporation will be recommended at their next meeting that an order for 80 trolleybus chassis be placed with British United Traction Co., who will supply them with electrical equipment provided by the English Electric Co. for 45 of the vehicles, and by Metropolitan-Vickers Co. for 35. The total value of this contract is £254,769. It is also suggested that orders valued at £367,097 be placed with Leyland Motors and Transport Vehicles (Daimler) for motor-bus chassis.

Pye's French Company

THE impending formation of a French subsidiary company to be known as Pye (France) S.A., is announced by Pye Ltd. Its primary object is to introduce into the French market the entire range of the firm's telecommunications products. Greatest interest will be in overcoming the difficulties caused by the increase in volume of traffic in Paris since the war. We understand that many industrial and commercial users are interested in overcoming delays caused by traffic blocks, by controlling their vehicles with two-way radio systems. Orders for such systems are already coming in.

New London Offices

EARLY next year, Simon Carves Ltd. are hoping to move from their existing London offices in Stratton St to Dover St. It was stated last week that the Stockport firm had taken the lease of a new office block nearing completion at 28 and 29 Dover St. The new block will have a total area of over 16,000 sq ft and will be known as Simon House.

Houses wired for Electricity But No Mains Cable

COMPLAINTS that tenants in Newcastle, Gateshead and Wallsend had had their houses wired for several months but there was no sign of a connection to the mains electricity supply, were reported at last week's meeting of the N.E. Electricity Consultative Council. As a result the Council's chairman, Mr W. S. Hall, warned householders who were expecting a supply of electricity at some future date, not to have their houses wired and their existing gas supply removed or cut until they knew exactly when the premises were to be connected.

Ald M. Bloom alleged that private contractors had received information about future cable laying schemes "from the inside," and had arranged to wire houses on that information. Later they had used the completed wiring schemes as an argument to persuade the Board to lay the cable more quickly. He asked for stricter disciplinary co-operation between the Board and private contractors. Ald Bloom asserted that the contractors had removed gas fittings to use the channels for wiring, which left the people concerned badly off, and some very disgruntled consumers for the Board, who were not to blame. Mr Hall pointed out that private enterprise was involved. It was competition, and the contractor did not worry as long as he got paid for the wiring work. The Board had complained to contractors about this situation before, Mr Hall said, and added that he would refer the matter to the Board, who might find it possible to withold the information regarding electricity supply projects from contractors.

LECTURES AT ROYAL INSTN. BEFORE CHRISTMAS

PRE-CHRISTMAS lectures at the Royal Institution are not devoid of electrical interest. Two lectures stand out from the electrical viewpoint. The first is on 25 Nov., when Dr B. F. J. Schonland, deputy director of A.E.R.E., Harwell, will speak on Lightning and the Long Electric Spark. He will describe various new methods now helping to explain the distribution of electric charges within the thunder-cloud and the generating mechanism responsible for them. The last lecture of the session will be by Sir Lawrence Bragg on the Discovery of Useful Electricity. He will describe and perform some of the early experiments of Galvani, Volta and Faraday on 9 Dec. In addition a series of four lectures on 25 Oct. and succeeding Tuesdays will be given by Mr R. H. Macmillan on Automatic Control and Production.

Dunlop Research

A CURRENT review of the work of the Dunlop Research Centre in Birmingham, and of its offshoots in Canada, Germany, Malaya and France, is given in an excellently produced book, a copy of which reached us last weekend. Its 80 pages are packed with information on the progress made to date in helping industry, agriculture, transport, aviation, medicine, sport and the home, and the whole is well illustrated with over 100 photographs. Among the pages can be found the result of investigations into the cause and prevention of sparks in operating theatres during the administration of anæsthetics, and many other completed inquiries and impending results. The Dunlop Rubber Co. can be as proud of their publication, as they can of their actual research work.

Trolleybus Profit covers Motor Bus Loss

SOUTH SHIELDS sixty trolleybuses are doing well, and are, in fact, supporting the motor buses operating in the town. In the year ended 31 Mar. last, the trolleybuses made a net profit of £16,332. The corporation's transport undertaking made a net profit of £14,609 after deducting the loss of £1,723 incurred by the motor buses. The figure of £14,609 is reported to be the highest since 1906.

Check in S. Wales Rural Projects is Likely

PERSISTENT agitation in S. Wales for more rapid progress in rural electrification received a check at last week's meeting of the Electricity Consultative Council. Chairman of the Board, Mr L. Howles, told members that in view of the present situation he could not encourage them to think supplies could be taken to more thinly populated areas until circumstances changed. Mr Howles referred to the Government's request for a 10% reduction in capital expenditure, and said the Board would have to meet the appeal with the least interference to plans. They were now expected to provide more of their capital needs from their own resources. He did not want to consider cuts, but they might have to contemplate slowing down or shifting priorities.

Electricity in Building in Bolton This Week

A CONFERENCE and exhibition on Electricity in Building has been arranged by the N. Western Electricity Board for builders, architects, decorators, plumbers and others interested in building. It is taking place at Bolton Town Hall this week, closing today (27 Oct.). Special features of the exhibition include economic wiring practices, built in supply positions, heat pumps, electric floor warming and generation by nuclear power. Each of the three mornings has been allocated to viewing the displays. On the afternoon of the first day, the conference discussed Electricity in Housing Improvements and Repairs, following a talk by Mr A. L. Osborne. Mr Philip Honey's conference on Adequate Wiring Helps to Sell Houses extended throughout yesterday afternoon and evening. This morning Mr A. F. S. Wright spoke on Electric Floor Warming Systems, and the conference ends this evening with a lecture by Mr T. O. Freeth.

OFFICIAL PUBLICATIONS

GAS. Reports and Accounts of Gas Council, Area Boards and Consultative Councils for 1954-55. (See page 628.) Available from H.M.S.O.

U.S. Subsidiary will have Glasgow Works

AN American firm, Aircraft Marine Products Ltd., are to establish themselves in a factory on the Port Glasgow industrial estate. They are a wholly-owned subsidiary of the Harrisburg (Pennsylvania) company of Aircraft Marine Products Inc., which was established in 1941 and has since expanded considerably to form subsidiaries in France, Holland and Puerto Rico, and a sales company in Canada. The factory is expected to be in production early next year with about 70 employees. The new firm will make solderless terminals for electrical appliances.

Six Mobile Showrooms will tour the Country

A SERIES of six mobile showrooms are being introduced by the General Electric Co., to tour the country exhibiting the company's products. Four of the vans have been completed and took to the road in recent weeks. Two carry displays of household appliances and are in Scotland and the Midlands, whilst the other two house installation materials and are in the Midlands after quick tours of London and the South. The two outstanding showrooms will be exhibiting light engineering products, and will be ready shortly. Each vehicle, when visiting an area will be at the disposal of the main G.E.C. branch there, and itineraries will be arranged so that as many people as possible will be able to see the displays. Each van can be adapted easily to house any class of product.

The amount of produce packed, without congestion, into the showrooms is remarkable. The household appliance vans include a range of fires, refrigerators, clocks, cookers, kettles, immersion heaters, water heaters, irons, washing machine, vacuum cleaner, floor polisher and coffee percolator. A more comprehensive display in so small a space is difficult to imagine. Special fluorescent lighting fittings provide illumination but the ceiling can be quickly rearranged to show a variety of lighting fittings. A generator incorporated in the vehicle provides a standard 230 V 50 c/s supply. The installation materials display is similar in layout, and comprises switchgear, wiring and other equipment of interest to builders, electrical engineers and local authorities. When completed, the light engineering displays will be equally appealing. On show will be fractional h.p. motors, battery chargers, ventilating equipment, Nightstor thermal storage heaters, space heating equipment, canteen cooking equipment, sanitary incinerators, and infra-red paint stoving equipment, to mention only a selection.

Retailer fined for Hire Purchase Infringement

AN infringement of the Hire Purchase and Credit Sales Agreements (Control) Order, 1955, was penalised at Newcastle-on-Tyne Magistrates Court recently. Loyds Retailers Ltd., of Manchester, were fined £25 with £26, 5s. 0d. costs for disposing of a television set without arranging for the required 15% deposit, and extending the repayment period beyond that allowed by the regulations. Particular shop involved was that in Groat Market, Newcastle.

Prosecuting for the Board of Trade, Mr R. W. Payne alleged that the television set was sold on a down payment of £3 and with 156 payments of 15s. 9d. extending over a period of three years, and 6d. a week thereafter. The customer was told, he maintained, that that was a rental scheme designed to by-pass the regulations. Evidence was given by seven customers that they did not know they were committing themselves to an indefinite payment of 6d. a week, but were under the impression they were buying the sets. The firm's secretary stated that every month circulars were sent to branches outlining changes in the law, but Mr Payne suggested they were just a blind to produce in court if the firm was prosecuted.

In defence, Mr Neville Laskin, Q.C., insisted that the television sets were disposed of under a rental scheme and not by hire purchase. The manager of the shop denied that the customer was told the set would be his whether he paid 6d. a week or not.

Chairman of the magistrates, Prof D. Burns, said a nominal fine would be imposed because the company had taken stringent precautions to prevent such a thing occurring.

Exide Selling back to U.S.A.

REVELATION at the annual Exide Motor Show luncheon by Mr H. V. Schofield, director of Chloride Batteries Ltd., was that their two "Porvic" plants were now producing twice as much as at first envisaged. Before they started producing Porvic mechanical separators they imported from the Americas some £500,000-£750,000 raw materials. Now they were exporting, back to Canada and the U.S.A., Porvic separators.

Mr Schofield announced that within the next few weeks they will hold the first of a series of trade gatherings in conjunction with their service agents at which they are going to show a new Exide film covering the manufacture of the battery and its components.

Christmas Decorations in Regent Street

Below is an artist's impression of Regent St. as it will look in December. Last year's Christmas decorations by the Regent St. Assoc. are to be repeated on a more ambitious scale. They will consist of some 1,200 snow crystal stars made in glittering expanded aluminium between 2 in. and 4 in. in diameter, and suspended by carrier wires about the street. The stars will be floodlit from both sides. Floodlights are to be supplied by the General Electric Co. and the installation carried out in co-operation with the London Electricity Board. The scheme is in the hands of Beverley Pick Associates, and W. S. Chrysaline Ltd. are making the crystal units

Fires in Shop Window— In Store or for Sale?

NINE electric fires which, it was alleged, were not fitted with guards as prescribed by the Heating Appliances (Fireguards) Regulations, 1953, were shown in the window of Norman A. Hough Ltd., of Kingsway, Levenshulme. The question before Manchester magistrates was whether the fires were offered for sale. Prosecution by the corporation, acting on a complaint by the fire prevention section of the City Fire Brigade, maintained the fires were offered for sale. The company, however, stated the Kingsway premises were used as a store, and the fires had been stored in the window along with other equipment since the regulations came into force and were not for sale. They contended that even if the fires had guards their saleability was questionable because they had become rusty in the past three years. The magistrates decided the fires were in fact exposed for sale and fined the company £2.

Electricity Meter is NOT a Money Box

THE Queen's Bench Divisional Court decided last week that a man who broke open his electricity meter and took the money back, was stealing. Magistrates at East Powder, St. Austell, had concluded that in such a case the consumer was using the meter as a private money box, and dismissed proceedings, whereupon the prosecutors appealed. The defendant was alleged to have stolen £20. 16s. 9d. which belonged to the S.W. Electricity Board. The justices found he had forced the padlock and extracted coins. The defendant continued to insert coins when he wanted electricity, but when the money was due to be collected there was only 8s. in the meter. His case was that the money he placed in the meter did not pass to the Electricity Board, and his only obligation was to pay eventually for electricity consumed. The Lord Chief Justice said "when money is put into meters it becomes the property of the electricity authority." Mr Justice Ormerod and Mr Justice Glyn-Jones agreed. They allowed with costs the prosecutor's appeal against the magistrates' dismissal of proceedings.

Anglo-German Trade Agreement

A NEW trading arrangement is announced between the Automatic Coil Winder and Electrical Equipment Co., and Blume and Redecker of Hanover. The effect will be that the British firm will take over sales of the German manufacturer's laminating, wire stripping and coil winding equipment for the U.K. and Commonwealth markets, and also for China, Japan, Argentina and Russia.

C.E.A. Win Damages Claim but Amount has still to be decided

JUDGMENT was reserved at Newcastle-on-Tyne Assizes in a claim for damages by the C.E.A. against the Alston Limestone Co., Ltd. The latter were alleged to have damaged a 66,000 V underground cable at Hawthorn Leslie and Co.'s shipyard at Hebburn in 1951.

Giving judgment last week, Mr Justice Oliver said he found negligence proved against the limestone company. They had been clearly warned of the danger of the cables, he said, and had been told that great care was needed in excavating. Mr J. F. Drabble, Q.C., for the C.E.A., said damages would have to be decided by a special referee.

A man employed by the defendants was stated to have struck the cable while using a pneumatic pick. Mr Drabble said that although the pick had not touched the cable, damage was done, and the C.E.A. alleged negligence and trespass.

Defending the Alston Limestone Co., Mr G. Waller, Q.C., said his clients had obtained information from the C.E.A. and were under the impression that the drilling would not go anywhere near the cable. The foreman in charge of the drilling stated that according to details given him, the cable was several feet underground, but in fact it was nearer the surface.

An electricity supply is brought to the remote village of Riccarton by the S. of Scotland Board. Construction of the 1½ mile 11 kV line was carried out by B.I.C.C. There is no access to the village by road

Mrs H. D. Williams, wife of the district manager, opens Walsall Conduits Ltd.'s new Plymouth branch in Regent St. Mr W. A. Millard, director, looks on

Brook Motors current display (right) in Westminster; and (below) an attractive Vactric window in Knightsbridge

The Duke of Edinburgh visits the G.E.C. stand at the Copenhagen Trade Fair. With the Duke, looking at the model of a nuclear power station, is Mr Leslie Gamage

Hire Purchase a Menace—Full Inquiry Sought

A SUGGESTION that the Government should institute a full-scale inquiry into hire-purchase schemes and the effects of such transactions on the country's economy, was made by the Scottish Unionist Association at their postponed annual conference in Glasgow last week.

The resolution was adopted by the narrow majority of 11 votes, about half the delegates abstaining after they had been told they had no right to dictate to people about the way in which they chose to live. The resolution was proposed by Mr J. Sutherland, who said hire-purchase was a menace to the economic salvation of the country and could be measured now as a way of life. It encouraged spending beyond means at a time when the reverse was needed. Mr G. Miles objected. He said businesssmen acquired overdrafts and steps to curtail hire-purchase had been taken. What more did the Association want? he asked. There are many, said Mr Miles, to whom H.P. was a godsend and the Association had no right to tell them how to live.

Progress with Radio Relay Systems

MEMBERS of the I.E.E. Radio and Telecommunication Section were provided with an authoritative review of the development of radio-relay systems in communication in the Address of their Chairman, Mr H. Stanesby, last week. In welcoming the decision to extend the section's activities to line communication, he went on to outline the way in which relay systems have come to be used for television and multi-channel telephony and the steps which are being taken to associate them with line systems. He opened by discussing line techniques and the development of multi-channel transmissions over one pair of conductors, and then considered types of radio relay systems and techniques, concluding by discussing the work of C.C.I.R.

Manual Workers' Claim

A FURTHER claim for a wage-increase is to be submitted at the 17 Nov. meeting of the National Joint Industrial Council for the Electricity Supply Industry. The claim concerns manual workers, many in power stations, who received increases of 3d. to 4d. an hour last January. The new claim will probably be passed to a negotiating committee for consideration.

Company moves Works Twice in Three Years

STEADILY growing demand for industrial electronic controls has forced Elcontrol Ltd. to move into a new and much larger factory. The company's theme is Automation Step by Step, and this would appear to appeal to industry both at home and abroad, judging by the mounting demand on the firm's level controls, flame failure equipment, timers and photoelectric units. It was only in the early half of 1952 that Elcontrol took over their present premises at Hitchin. These are now inadequate and they are now going to a newly built factory next door which will provide three times the floor area and plenty of room for development

Conference for E.A.W. Branch Officers

ABOUT 160 members of over 90 branches of the E.A.W. are attending a Branch Officers' Conference at Harrogate this week. The conferences are held every two years to give officers and prospective officers an opportunity of learning how to carry out the voluntary work in the best way. The conference opened on Tuesday and ends tomorrow (28 Oct.).

WATERS OF THE MOON

THE above comedy was performed last week by the Portland Players at Toynbee Hall, Commercial St, E.1. This amateur dramatic group, a section of C.E.A.'s sport and social club, delivered a performance approaching professional standards which did not pass unrecognised by an appreciative audience. Imaginatively produced by William Usher, the play got off to a slow start in the first act but therafter increased in pace and rhythm. The complete cast acted with sincerity and vigour, Pamela Love as Evelyn Daly and Margaret Corkish as Helen Lancaster, deserve special mention for perfecting two difficult parts. In the more sensitive scenes, Archie Lusk as Julius Winterhalter gave an impressive performance.

Distribution of Sales Information Overseas

IT IS not enough to make good products, their quality must be known in the markets in which it is hoped to sell them. In an effort to tell firms how to make this information known in overseas markets, the Federation of British Industries has published a guide entitled, "Telling Industry's Story Overseas." The introduction to the booklet states that information about a firm's products in the newspapers or technical trade journals, on the radio, TV or in films, helps to arouse interest in the company's products and also helps to build up the prestige of British industry as a whole.

The booklet is divided into three main sections. In the first is a description of the final outlets for industrial information (as distinct from advertising). The second describes the channels through which information may be fed to these outlets, such as news and photographic agencies, foreign correspondents and the Central Office of Information. Advice on the way in which firms can make the best use of these channels is given in the third chapter. There are also four appendices, including a list of journals published in the U.K. and circulating abroad, and a guide to the world's TV networks. The 61-page booklet is available from the F.B.I. at 3s. 6d.

Royal Society Prizes

ENDOWED prizes for 1955 have been awarded by the Royal Society of Arts. Three were involved. The Howard prize of £50 for mechanical motive power has been given to Mr W. C. Ikeson for his paper on a new conception of the oil fired steam locomotive. Seven entries were submitted. Best among nine essays submitted for the Benjamin Shaw prize of £20 for industrial safety, was that by Mr A. E. Griffiths on his dust and swarf extractor. Finally, Mr A. R. Broomfield won the Fothergill prize of £20 for fire prevention or fire fighting, with his essay on a cheap automatic fire alarm.

The First Half-Century

On Saturday last the curtain was rung down on the Electrical Exhibition. Shortly before ten, the rival ladies of the lamp—Ediswan and the Robertson girls—ascended to the gallery and ranged up alongside the band, while the crowds massed themselves around the statue of Victory. Then the choir aloft sang a verse of "Rule Britannia" and the crowd below followed suit. This was succeeded by "God Save the King," rendered by the entire strength of the company, while one of the managers vigorously wagged a Union Jack. The musical celebration over, there was a spontaneous outburst of cheering, which continued while the people made for the doors. In spite of misgivings entertained earlier in the day by some exhibitors, there was no trace of disorder or ragging. The conduct of the thousands present was perfect; they were enthusiastic, but extremely well-behaved. The rowdy element that makes a practice of playing the bull in the china shop on closing night no doubt thought Earl's Court a more congenial spot.—*From our issue of 26 Oct., 1905.*

First Aim is to stabilise Prizes

THERE were over 400 members and guests present at the Birmingham Electric Club's 39th annual dinner, held at the Grand Hotel last Friday. They heard Mr J. Eccles, dep. chairman (operations), of the C.E.A., speak about prices and wages. He said wages followed prices in an ever-ascending spiral and the first objective was to stabilise prices. There would then be justification for insisting that wages did not increase faster than output. Mr Eccles said it would be a fine thing if industrialists and industrial federations could enter into a pact with their workpeople that, so long as wage claims were not made, there would be no increase in distributed profits and that the remaining trading surplus would be controlled by reducing prices. Above all, prices should be held at a level that would make our goods attractive in world markets. Mr Eccles was replying to the toast of the guests.

Proposing the Club, Ald J. R. Balmer, Birmingham's dep. mayor, advocated closer co-operation and co-ordination between the fuel and power services to evade winter power cuts. Claiming that we tend to be too wasteful in the use of coal, Ald Balmer asked how we would meet the demand for coal in the future and what alternative power supply would there be. By 1965, energy equal to 300m tons of coal would be needed annually. Atomic energy contributions would still not be large. Later Mr H. C. Fox, president, suggested hydro-electricity.

Sir John Dalton, chairman, replies to the toast "The Henley Companies" at the annual staff dinner and dance. Right, Dr Dunsheath with the Rowson twins, and assisted by Mr A. S. Brewer, makes the draw for the lucky menu prizes

F.B.I. Trade Mission visits Austria

A TRADE MISSION, travelling under the auspices of the Federation of British Industries, is spending the latter part of this week in Austria. The party is going to offer assistance with the re-equipment of factories and public services now restored to Austrian control. The F.B.I. have been in consultation previously with their Austrian counterparts, Vereinigung Osterreichischer Industrieller. Industries to which the party is devoting particular attention are electronics, machine tools, diesel engines, diesel-electric and electric locomotives, textile machinery, chemical plant, oil drilling and refining plant and building machinery. The mission is led by Sir John Duncanson, and among its members are Mr C. R. Dawson of English Electric and Mr W. J. Richards of Marconi Wireless Telegraph Co. Members proceeded independently to Vienna and assembled on Wednesday.

NEWS IN BRIEF

This week is Safety Week. The Royal Society for the Prevention of Accidents is running a campaign for safer working in industry with leaflets, posters and talks.

Five-day residential course on Wage and Salary Structure and Administration is to be staged by the Inst. of Personnel Management between 6 and 11 Nov.

An increase of over 7% in sales for the 16 months covered by the accounts was reported at the annual meeting of British Luma Co-operative Electric Lamp Society. Production had been stepped up by nearly 7%.

Flame Radiation Research Joint Committee, 6 De Vere Gdns, London, W.8, will be inaugurating their new pulverised fuel furnace and experimental plant on 12 Nov. at Ijmuiden, Holland.

Over 200 managing directors and general managers will be attending the second annual dinner of the Inst. of General Managers at the Savoy Hotel, London, on 9 Dec. Principal guest of honour will be the Viscount Bruce of Melbourne, former Prime Minister of Australia.

The 1955 Year Book has been published by E.I.B.A.

Patients at two Lancashire hospitals will enjoy special football commentaries from the local ground. Necessary equipment has been installed at Preston's Hospital for Infectious Diseases and Fulwood Continuation Hospital by Communication Systems Ltd.

A radio-telephone service has been opened between Bahrain in the Persian Gulf and Karachi (Pakistan), Cable and Wireless Ltd. announce.

Leadership in the Twentieth Century is the title of a series of five lectures to be delivered at the Polytechnic, Regent St, by Lt-Col L. Urwick. The first will be on 17 Nov. The series is being sponsored by the Polytechnic Management Association.

New turbo-blower costing over £750,000, an additional open hearth furnace and ancillary equipment, costing £800,000 and an ingot stocking, handling and loading gantry with a 7 ton electric overhead travelling crane, costing £100,000, will be installed at Scunthorpe works of Appleby-Frodingham Steel Co., a branch of the United Steel Cos., Ltd.

Hurseal Ltd. held an At Home at the Building Centre in London last week. Mr A. C. Hazell addressed the gathering, and there was an accompanying exhibition.

Consolidated Tin Smelters have bought the assets and undertaking of Geo. L. Scott and Co., Ltd., electrical steel stampers of Ellesmere Port.

An automatic telephone exchange has been supplied by the General Electric Co., Ltd., to Messrs Chr. Salvesen and Co. for installation at their Whaling Station in South Georgia, one of Falkland Islands Dependencies.

ELECTRIC SUPPLY NEWS

Cardiff

The Glamorgan River Board Pollution Prevention and Fisheries Committee are to take up with the C.E.A. the question of the temperature of water returned to the River Taff from the Upper Boat power station. At a recent meeting of the Committee, the chief officer, Mr H. H. Williams, said that in addition to chemical discharges into the river the temperature of the water from Upper Boat was an additional danger to fish.

Dorset

The multiplicity of overhead lines, to which extensions were frequently added with further development of housing estates, often spoiled the attraction of many of Dorset's lovely villages, it was stated at a meeting of the Dorset branch of the Rural District Councils' Association last week. The branch approved a resolution that Electricity Boards should be required to undertake an annual programme for placing mains underground. One member, Mr F. Guppy, although in general sympathy with the resolution pointed out that the cost of laying mains underground was many times greater than the o.h. line cost. In his view there needed to be a certain amount of give and take on both sides to ensure that the sorely needed electricity was got to the countryside as cheaply as possible. Another member commented that although the network of wires seemed hideous at first, one became used to them and in time they gradually ceased to be a disfigurement. The branch agreed unanimously that the lines were spoiling the countryside, but felt that it would be wrong to insist on wires going underground.

Sayings OF THE WEEK

"It strikes me as rather hard that we as a county, and other Highland local authorities who supply the catchment areas (of hydro-electric schemes) with very large rivers, should not be entitled to some concessions or favourable treatment just as a Lanarkshire miner is entitled to supplies of coal at pithead prices." . . . LORD LOVAT, at Inverness.

"Purchase-tax is clumsy, anomalous, tyrannical, and without exception, the worst tax ever devised." . . . CAPT L. P. S. ORR, M.P., speaking at Belfast.

"You can get out of your heads that all American homes are streamlined with model labour-saving kitchens. It is true there are such homes in the States but it is equally true of this country." . . . MR J. F. SMITH, chief commercial officer, South Wales Electricity Board, addressing Newport branch of the E.A.W.

Douglas

The formal commissioning of a new 3,750 kW turbo-generator at Douglas Corporation's Pulrose power station, took place a few days ago. The ceremony was performed by the Lieutenant Governor.

Isle of Man

Operations of the Isle of Man Electricity Board for the year ended 31 Mar. last resulted in a net surplus of £4,341. Over 17 million units were sold to the 9,798 consumers, at an average price of 2·239d. per unit. Farm holdings connected to the end of the year totalled 830, and more than half of them have electric cooking and milking equipment. A propaganda campaign resulted in 428 cookers being sold, hire purchased or hired during the year. Appliances sold represented a connected load of 4,000 kW, and during the year the revenue from the Contracting Department alone exceeded the total revenue of the undertaking in 1941. There was a 100% increase in hire purchase turnover, and over 700 cookers have now been installed under that scheme. On the distribution side, 4¼ miles of o.h. line were erected and six new substations constructed.

Kent

An application by the South Eastern Electricity Board for consent to erect an overhead line over a small part of Ashdown Forest to supply six cottages in the St. John's area of Withyham, has been approved by the Board of Conservators of Ashdown Forest. The Board has stated that no poles would be erected in the forest. In addition, the line would pass over only two 25 ft lengths of the forest. This is the first time o.h. lines have been permitted over Ashdown Forest, but the Conservators have emphasised that this is not to be taken as a precedent.

LIGHTING SCHEMES

Fleet. U.D.C. has agreed in principle to conversion of gas street lighting to electricity.

Folkestone. Highways and Buildings Committee has approved scheme for relighting of Sandgate Hill, Sandgate High Street, and the Esplanade, Sandgate, at a cost of £4,000.

Rotherhithe. London County Council propose to install fluorescent lighting in Rotherhithe Tunnel at an estimated cost of £35,000.

Sheffield. The Watch Committee has approved the installation of 115 sodium lamps along Eccleshall Road South, and similar lighting along Greenland Road, Herries Road and Weedon Street.

Wandsworth. B.C. has approved a plan for providing sodium lighting in 358 roads and footpaths, at a cost of £189,000.

COMPANY ACTIVITIES

MR W. H. McFADZEAN, the new chairman and managing director of British Insulated Callender's Cables Ltd., held his first Press conference on Wednesday last, the occasion being the company's decision to raise £5m by the issue of new Ordinary shares to shareholders at 38s. each. Shareholders will be given full details on the 28th. In the meantime Mr McFadzean disclosed that it was rising costs, particularly of copper; further expansion of several of his company's products; and the need for further new plant and machinery which required the extra working capital. In addition, he proposes to continue the company's policy of overseas investment in cable and manufacturing units throughout the world. B.I.C.C. buys its copper from the Rhodesian Selection Trust Group which fixes prices for its customers once a month in order to iron out some of the heavy fluctuations which have been taking place. Even so, Mr McFadzean pointed out that since the last issue of capital in 1952, the price of copper has varied between £227 to over £400 per ton and is at present approximately £350 per ton. He told the conference that a £10 fluctuation in the price of copper can affect his company's working capital by £300,000 to £400,000.

Mr McFadzean gave me some details of the group's proposed direction of expansion. These included the greater use of plastics; aluminium-insulated cable; special heat-resisting cables for aircraft necessary because of the jet age; also new techniques for telephone and power cables. He also debunked the view taken in some quarters that if copper remains dear it could be replaced by aluminium. Aluminium, he said, is all right for some manufactures but not all. It is, for instance, difficult to join. In his view there would be a substantial field for both metals in the future.

The directors of Hoover Ltd. have had to drop their proposed capital reorganisation scheme. The object of the scheme was to get rid of the highly-geared dividend payments on the "A" ordinary shares. These "A" shares were originally issued to executives as an incentive but have now got into the hands of speculators and institutions who are determined to have their pound of flesh. Under the scheme which has now been dropped a bonus of over 500% was offered them. But that apparently was not sufficient.

The Board are determined to put forward a modified scheme.

Let this be a lesson to other boards who contemplate bringing in their staff on extra favourable terms, and failing, at the same time to prevent such shares getting into the hands of those who have never lifted a finger to increase the productivity of the firm.—*From our City Correspondent.*

British Insulated Callender's Cables Ltd.

There is to be an issue of 2,650,000 new Ordinary £1 shares at a price of 38s. each, of which 2,470,000 will be offered to existing stockholders in the proportion of one-for-five. Stockholders can also apply for the balance of 180,000 shares at the same price. The new capital will not rank for the 1955 interim dividend. The directors indicate that the additional £5m capital is required for many purposes. Prices of materials are still high, for instance, while substantial sums have been, and are being expended on new plant and machinery. Considerable reorganisation and re-equipment of factories is also planned. It is expected that with the high level of activity this year, the profit should show a substantial improvement over the 1954 figure, and the directors anticipate recommending a total dividend of 12½% for the year, with an interim of 4%. There is at present a full order book and whilst some fluctuation in trading results must be expected from time to time the directors view the future of the group with confidence.

Bullers Ltd.

Net profit for the year ended 31 July last is £43,765, compared with £62,005 for the previous year. A final dividend of 10% again makes the total 15%.

Contactor Switchgear Ltd.

For the year ended 31 July last, the profit, before taxation, is £115,621 (*£124,889*), and after all charges including taxation, the net profit is £55,168 (*£48,942*). The final dividend is 12% (*18%*) making a total of 18% on capital as increased by a one-in-three scrip issue, against 22½% last time on the old capital, equivalent to 16½%.

Crabtree Electrical Industries Ltd.

A substantial increase in the group net profit for the year ended 31 July last, is reported by the directors. After depreciation and higher taxation charges, the figure is £129,759 compared with £93,879 a year earlier. A final dividend of 12½% again makes the total 20%. The consolidated trading profit total is £360,493 (*£294,454*). Tax free dividends amounting to £80,000 have been received by the company from its subsidiaries.

Dorman Smith Holdings

A big jump in profits for the year ended 31 Mar. last is reported. The figure is £99,509, compared with £67,590 for the previous period. The Ordinary dividend is raised by 1½% to 6%.

Electric and Musical Industries Ltd.

The consolidated trading profit for the year to 30 June last is £3,170,000 compared with £2,074,000 a year earlier, according to the preliminary statement. After charging various items, but before taxation, the profit figure is £1,980,000 (*£1,076,000*). The dividend is 12½% plus a bonus of 2½%—5% higher than for the previous year.

English Electric Co. Ltd.

The offer of 3,805,430 £1 Ordinary shares at £3 each on a one-for-three basis, has been fully taken up by shareholders.

Hoover Ltd.

Because of opposition from the "A" Ordinary shareholders to the proposed scheme of capital reorganisation (to which we referred on 29 Sept.), it has been decided to drop the plan. Instead, the directors are consulting the larger holders of the Ordinary stock and "A" Ordinary shares with a view to putting forward a modified scheme acceptable to both classes, of which details will be announced later.

Kalgoorlie Power and Lighting

Report for the year ended 31 Dec., 1954, shows a net loss of £35,444, to which is added a loss on sale of assets of £787, total being £36,231. After deducting credit brought in £12,648, there remains a debit carry forward of £23,583.

Perak River Hydro-Electric Power Co.

Some 432 million units were generated during the past year, compared with 390 millions in the previous period. A further 12 MW turbo-alternator and associated boiler have been ordered for delivery by June 1957. A final amount has been received in respect of the War Damage Claim, leaving a balance of £160,131 irrecoverable. The subsidiary concern, Kinta Electrical Distribution Co. had a trading profit of £59,367 for the past year, against £52,079 a year earlier.

Year to 31 July	£ Gross Revenue	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	1,138,781	164,201	14	—	14/–	8/3
1952	1,266,705	132,777	11	—	15/–	10/9
1953	1,385,190	159,117	13	6	17/10	13/7
1954	1,449,571	233,651	21	10	20/3	13/6
1955	1,592,995	320,200	23	10	22/1	17/4

Solus Teoranta

This Eire lamp making concern proposes to revalue its assets and increase its capital to £250,000 for the purpose of distributing to existing shareholders one new "B" Ordinary £1 share for every "A" or "B" Ordinary held.

West London and Provincial Electric and General Trust

Revenue for the year to 30 Sept. last is £62,509 (*£48,342*), and profit before tax is £49,948.

Dividends Declared

Ever Ready Co. (Gt. Britain). Interim 10% (*same*).

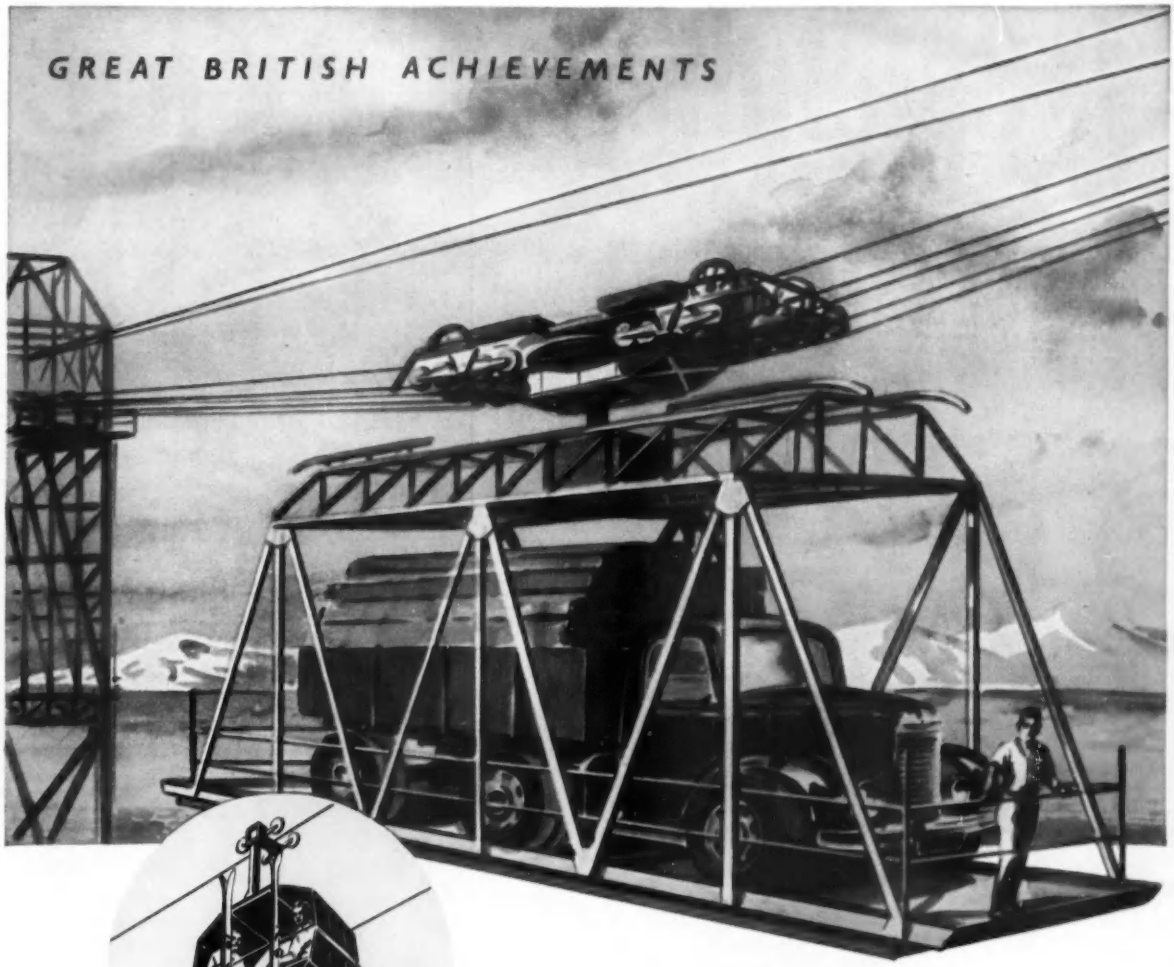
London Electric Wire and Smiths. Interim 3½% (*same*) but on larger capital.

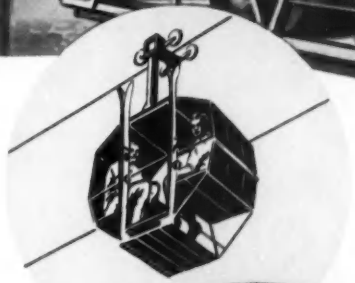
Senior Economisers. Interim 20% (*17½%*).

Siemens Bros. and Co. Interim 2½% (*nil*).

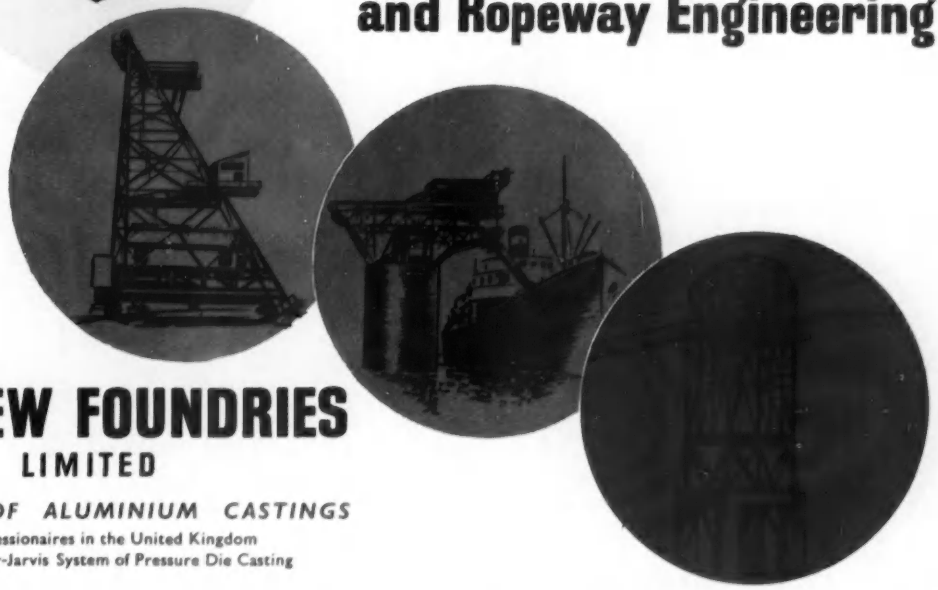
Stream-Line Filters Ltd. Interim 10% (*7½%*).

GREAT BRITISH ACHIEVEMENTS





Overhead Cable
and Ropeway Engineering



RENFREW FOUNDRIES
LIMITED

SUPPLIERS OF ALUMINIUM CASTINGS

Sole Concessionaires in the United Kingdom
for the Doehler-Jarvis System of Pressure Die Casting

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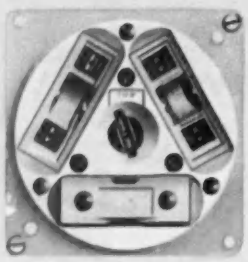
Splendid Isolation

Attractively designed cover and cast iron case of the MEM Rotary Fused Isolator are finished in grey stove enamel.



Fuse inspection is absolutely safe. The fuse sockets are isolated by the removal of the cover and it is impossible to touch live metal.

Wiring is especially easy. Heavy clamp terminals are provided and are clearly identified. An indicator shows whether the switch is on or off.

The three phases of the robust cam operated switch are separated by thick porcelain walls. Contacts are solid silver. Inspection is simple once the plastic switch cover is removed.

Handsome appearance and high efficiency go hand in hand here, in the MEM Rotary Fused Isolator.

Designed for use with A.C. Motors on machine tools and other similar applications, this switch is of a slow break A.C. pattern rated at 15 amps., 500 volts. It will safely disconnect a stalled motor of 7½ h.p. taking six to eight times full load current.

The unit takes 15 amp., rewirable "Kantark Major" fuses or alternatively you can choose standard H.R.C. fuse links to the dimensions of B.S.88 1952, Appendix J.

Fuses can be inspected or renewed in perfect safety. The cover can only be removed when the switch is in the 'off' position, and then the fuse contacts are completely isolated from the incoming supply.

Two patterns are available, for flush or surface mounting.

MEM

Send for illustrated leaflet

MIDLAND ELECTRIC MANUFACTURING COMPANY LIMITED · TYSELEY · BIRMINGHAM 11

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

28 Oct.—Clay Cross U.D.C. Group A lighting units over ¼ mile of A.61.—Advertised in 29 Sept. issue.

28 Oct.—East Antrim. Installation in Sir Thomas and Lady Edith Dixon Hospital, Cairndhu.—See 20 Oct. issue.

28 Oct.—Hyde T.C. Sodium and fluorescent street lighting units, concrete columns, etc., for Group A schemes.—See 13 Oct issue.

29 Oct.—Higham Ferrers T.C. Concrete columns, lanterns, tungsten lamps, etc., for Class B installation.—See 20 Oct. issue.

29 Oct.—Milford Haven U.D.C. Concrete columns with sodium lanterns, for Group A street lighting along A.4076.—See 6 Oct. issue.

31 Oct.—N. Ireland. Installation in R.U.C. District and U.S.C. County, headquarters and married quarters at Magherafelt.—See 20 Oct. issue.

31 Oct.—Lancashire. Electrical work at Eskdale Hostel for old people, Birkdale, Southport; and same at Hutton police headquarters, nr. Preston. Apply by above date to County Architect, P.O. Box 26, County Hall, Preston, quoting ref.: A/MG. Deposit £2, for each job.

31 Oct.—Reigate T.C. Class A street lighting equipment on A.23.—Advertised in 13 Oct. issue.

31 Oct.—Stranraer T.C. Installation in block of flats in Foundry Lane.—See 29 Sept. issue.

31 Oct.—Thornaby-on-Tees T.C. Installation in 24 bungalows on Redcar Rd site.—See 20 Oct. issue.

2 Nov.—Dublin. Alterations to electrical system in change-over from d.c. to a.c. at Mental Hospital, Portrane. J. A. Kenny and Partners, consulting engineers, 44 Kildare St. Deposit £10, 10s.

2 Nov.—Co. Tyrone. Electrical installation in 110 houses at Ballycolman, Strabane. J. J. Cassidy, surveyor, Railway Rd, Strabane. Deposit £5.

3 Nov.—Belfast T.C. Supply and connection of electric range and rewiring at Graymount school meals kitchen; and renewal of lighting circuits at Park Parade school meals kitchen. Education Architect's Dept., 40 Academy St.

3 Nov.—Knaresborough U.D.C. Supply and erection of 17 Group B columns with mercury discharge lamps and control gear on Manor estate and approach. Engineer and Surveyor, Knaresborough Hse.

3 Nov.—N. Ireland. Installation in 137 dwellings at Ballyclare.—See 20 Oct. issue.

4 Nov.—Belfast T.C. Supply of street lighting remote control equipments and control switches (specif. W.87); and of floodlighting fittings, sodium lamps, etc. (specif. W.88). Electricity Dept., East Bridge St.

4 Nov.—Berwickshire. Installation in 64 houses on eight sites.—See 13 Oct. issue.

4 Nov.—Bradford. Lamps during 1956.—See 20 Oct. issue.

4 Nov.—Maidstone T.C. Electrical installation in 12 houses on Shepway estate. Borough Surveyor, Palace Ave.

4 Nov.—Plymouth T.C. 1,930 socket outlets and 230 spur units in Council dwellings and about 1,890 electric fires.—Advertised in 20 Oct. issue.

4 Nov.—Staffordshire. Wiring installation at Warrington school, Rocester. Apply by above date to T. H. Evans, clerk of county council, County Buildings, Stafford.

5 Nov.—Dagenham T.C. Group A and B street lighting units for conversion scheme.—See 20 Oct. issue.

5 Nov.—Inverness. Electrical installation in 22 houses at Beauly, 24 at Kiltarlity, 10 at Croy and 4 at Tornagrain. Apply by above date to J. Shankley, 2 Ness Walk, Inverness.

5 Nov.—Leeds T.C. Group A street lighting schemes in Scott Hall and Harrogate Rds, and in Easterley Rd.—Advertised in 6 Oct. issue.

5 Nov.—Ludlow T.C. Sodium lighting units along Newport-Shrewsbury trunk road.—Advertised in 13 Oct. issue.

5 Nov.—New Windsor T.C. Lamps and electric fittings and cable during 1956.—See 13 Oct. issue.

7 Nov.—Merthyr Tydfil. Pumping plant for Taf Fechan Water Board.—See 29 Sept. issue.

7 Nov.—Skipton U.D.C. Mercury vapour discharge street lighting units and steel columns for trunk road.—See 13 Oct. issue.

7 Nov.—Tonbridge (Kent) R.D.C. Electric wiring in houses and flats at Horsmonden, Matfield and Pembury. Engineer and Surveyor, 48 Pembury Rd.

9 Nov.—Co. Antrim. Installation in Largymore primary school, Lisburn.—See 20 Oct. issue.

9 Nov.—Newark-on-Trent T.C. Concrete and steel columns mercury lighting equipment, for Group A lighting along trunk roads A.46 and A.17.—Advertised in 20 Oct. issue.

11 Nov.—Abingdon T.C. Sodium lanterns, auxiliary gear, concrete columns, etc., for Group A lighting along trunk road A.34.—See 20 Oct. issue.

11 Nov.—Malden and Coombe T.C. Sodium lanterns on concrete columns for Group A lighting in Church Rd.—See 20 Oct. issue.

11 Nov.—Co. Meath. Electrical installation at Dunslaughlin school extension. J. F. McCormack, architect, 4 Fitzwilliam St, Dublin. Deposit £5.

12 Nov.—Port Talbot T.C. Installation of about 120 Class A steel columns, 3/80 W fluorescent lamps, 140 W sodium discharge lamps and auxiliary equipment along trunk road A.48. Borough Engineer, Municipal Buildings. Deposit £2. 2s.

14 Nov.—Bentley-with-Arksey U.D.C. Electrical installation at 26 houses at Scawthorpe. Surveyor, Council Offices, Cooke St, Bentley, Doncaster. Deposit £1. 1s.

14 Nov.—Bristol T.C. Electrically illuminated and operated signals for pedestrian crossings.—See 20 Oct. issue.

14 Nov.—Chadderton U.D.C. Supply of total of 250 street lighting lanterns of 60 W sodium, 80 W mercury, and 150 W tungsten types with control gear and swan-neck brackets. Surveyor, Council Offices.

14 Nov.—Lichfield T.C. Supply and erection of 45 steel columns for sodium lanterns with wall brackets and fluorescent lanterns, for Group A lighting along Exeter-Leeds trunk road A.38. City Engineer and Surveyor, D. Oglesby, Guildhall. Deposit £2. 2s.—Advertised in this issue.

15 Nov.—Southampton T.C. Electrical installation at Thornhill junior and infants' school. Borough Architect, Civic Centre. Deposit £1.—Advertised in this issue.

16 Nov.—Edinburgh. Electrical maintenance work at five hospitals for Royal Victoria and Assoc. Hospitals' Board of Management. A. G. Welstead, secretary and treasurer, City Hospital, Greenbank Drive. Deposit 10s.

18 Nov.—Blackpool. Supply and erection of pumping plant at Goosnargh, for Whitechapel water supply comprising one electrically driven pump with switchgear, pipework, etc. Engineer to Fylde Water Board, Head Office, Sefton St, Blackpool.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 142 queries answered this week

Heated waistcoats, suppliers of? W.H.S.—Sondan Co., 107 Gt. Eastern St, E.C.2.

"Silent Giant" hair clipper, repairers of? T.B.—Fitzroyal Eng. Co., 15 Greek St, W.1.

Box for hollow partition walls, noted by "Megohm" on page 521 of 6 Oct., 1955, issue, makers of? J.C.—J. H. Tucker and Co., Ltd., Kings Rd, Tyseley, Birmingham.

"Express" commercial hairdryers, makers of? T.B.—Dexters (London) Ltd., Station Works, Westhall Rd, Upper Warlingham, Surrey.

"Sunhouse" fires, makers of? R.B.—H. Frost and Co., Ltd., Fieldgate, Walsall.

"Edy" washing machines, address for? S.W.B.—Pollard Ray and Sampson Ltd., 235 Imperial Drive, Harrow.

Earth loop testers, makers of? E.M.S.—British Central Electrical Co., Ltd., 6/8 Rosebery Ave, E.C.1; John Drummond (Engrs.) Ltd., 23 Lochburn Rd, Maryhill, Glasgow; Foster Transformers Ltd., South Wimbledon, S.W.19; Meritus (Barnet) Ltd., Wood St, Barnet, Herts; Evershed and Vignoles Ltd., Acton Lane Works, W.4.

19 Nov.—Co. Galway. Pumping and filtration plant at Oughterard.—See 29 Sept. issue.

21 Nov.—Middlesex. Cables for power supply, with lighting and plug circuits at Mogden purification works.—Advertised in 20 Oct. issue.

28 Nov.—Fifeshire. Steel columns, sodium lanterns, etc., for Group A lighting at Windygates.—See 13 Oct. issue.

28 Nov.—Heckmondwike U.D.C. Supply and erection of 36 400 W mercury vapour lighting units on concrete columns along Liverpool-Leeds-Hull trunk rd, A.62. Engineer and Surveyor, Council Offices. Deposit £1. 1s.

30 Nov.—Tottenham B.C. Supply of electric lamps in year from 1 Apr., 1956. Apply by above date to Town Clerk, Town Hall, N.15.

1 Dec.—Cheshire. Approved lists of contractors are being compiled. Applications, including those in respect of electrical installation work should be sent by above date to E. Mainwaring Parkes, County Architect, The Castle, Chester.

2 Dec.—Mablethorpe and Sutton U.D.C. Supply and erection of two electrically operated submersible pumps with switchgear, pipes, valves, etc., at Maltby pumping station. Council Offices, Mablethorpe, Lincs. Deposit £2. 2s.

3 Dec.—Lincoln. Land drainage pumps and electric motors, etc., for Upper Witham Internal Drainage Board.—See 20 Oct. issue.

5 Dec.—Leeds T.C. Electrically-driven centrifugal pumps with motors and switchgear for Headingley filtration works pumping station.—See 6 Oct. issue.

12 Dec.—Easthampstead R.D.C. Group A and B street lighting units.—Advertised in 13 Oct. issue.

11 Jan., 1956.—Dublin T.C. Supply and erection of 3 vertical spindle 2-speed centrifugal sewage pumps and electric motors (capable of pumping 1,900 g.p.m.), and one vertical spindle centrifugal storm water pump and electric motor (2,000 g.p.m.) for Kilbarrack pumping station. City Treasurer, Exchange Bldgs, Lord Edward St. Deposit £5. 5s.

No date stated—Devon. Sodium lanterns on concrete columns at Drumbridges roundabout.—See 20 Oct. issue.

No date stated—N. of Scotland H.E. Board. 11 V power and auxiliary cables at St. Fillans power station.—Advertised in 20 Oct. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

17 Nov.—Malaya. Supply of three pumping sets with 400 V motors, starters, switchgear, etc., all 3-phase, 50 c/s. Tender WE/NW 5/55. City Water Dept., Singapore. Allen and Williams, 1 Victoria St, London, S.W.1. B.o.T. (Ref.: ESB 22408/55).*

21 Nov.—India. Supply of control panels with wiring, meters, relays, control switches, etc., for Howrah, Belmuri and Burdwan substations. Tender ED 718-3. Electricity Dept., Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta 27. B.o.T. (Ref.: ESB 22344/55).*

21 Nov.—Tangier. Electrification of houses including erection of l.t. overhead supply network on wood poles, secondary networks and interior installations. Water and Electricity Board, Tangier.

23 Nov. — Uruguay. Administracion General de las Usinas Electricas y los Telefonos del Estado require circuit-breaker of three-pole air-break type for 600 V, 50 cycles, to operate on circuit of 380 V on switchboards at Rincon del Bonete power station. Specif. No. 2412, Tender 4219/55. (B.o.T. (Ref.: ESB 21243/55).*

25 Nov.—India. Supply of power circuit-breakers for power supply to Eastern Railways at Howrah, Burdwan and Belmuri. Specif. No. ED715-3 Dep. Chief Electrical Engineer (E and R) Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta. B.o.T. (Ref. ESB 21862/55).*

25 Nov. — South Africa. Tenders (C.5363) invited for supply of 45 items of electrical signalling material. Stores Dept., S. African Railways, Johannesburg. B.o.T. (Ref.: ESB 22122/55).*

29 Nov.—Australia. Manufacture, supply, etc. of four three-pole, 12·5 kV, 4,300 amps, 1,000 MVA circuit-breakers, and / or four three-pole 12·5 kV, 4,300 amps isolating switches for T1 power station. Contract No. 40,011. Snowy Mountains Hydro-Electric Authority. B.o.T. (Ref.: ESB 21725/55).*

29 Nov.—Uruguay. External lighting appliances for external illuminations of Palacio de la Luz including 28 street lighting units for 500/1,000 W lamps, and 200 1,000 W, 160 500 W and 50 200 W lamps all 230 V. Specif. 2278. Administracion General de las Usinas Electricas y los Telefonos del Estado, Seccion Licitaciones, Montevideo. B.o.T. (Ref.: ESB 21758/55).*

30 Nov.—Rhodesia and Nyasaland. Transmission work in Kariba scheme involving about 900 miles of 330 kV single circuit, flat spacing steel tower transmission lines. Apply to Secretary, Federal Hydro-Electric Board, P.O. Box 630, Salisbury, by above date, with copy to consulting engineers, Merz and McLellan, Carliol Hse, Newcastle-on-Tyne.—Advertised in this issue.

6 Dec.—New Zealand. Supply of total of nearly 70,000 ft telephone switchboard wire, conductor sizes of ·024 in. and ·036 in. and various colours. Contract P and T 157/322. Store Div., Post and Telegraph Dept., Willis St, Wellington. B.o.T. (Ref.: ESB 21940/55).*

7 Dec.—Persia. Preparation and erection of installations for Chahroud-Machad and Mianeh-Tabriz railway lines. Electrical work includes vertical type diesel motors, distribution board, cables and air-conditioning plant. Administration Generale de Construction du Ministere des Voies, Tehran. B.o.T. (Ref.: ESB 21608/55).*

14 Dec.—Australia. Tenders (specif. 507) invited by Queensland State Electricity Commission, Brisbane, for electric batteries and charging equipment required by Townsville Electricity Board. B.o.T. (Ref.: ESB 20800/55).*

4 Jan.—India. Manufacture, supply, etc., to Riverside power station at Kanpur of two 1,300 kVA 6·6/3·3 kV, two 650 kVA 3·3/0·4 kV, and one 400 kVA 3·3/0·4 kV. Documents at Rs 75 a set from K. C. Gupta, General Manager, Kanpur Electricity Supply Admin., Kesa Hse, 14/71 Civil Lines, Kanpur.

14 Feb.—New Zealand. Tenders (No. 292) invited for 3-phase 2,500 kVA 11 kV 50 cycles tap changing on load regulating transformer, outdoor type, oil immersed and natural cooled; and 3-phase 500 kVA 11 kV earthing transformer outdoor type, oil immersed and natural cooled; or 3-phase 2,500 kVA 11 kV 50 cycles regulating transformer incorp. earthing transformer. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 21950/55).*

21 Feb.—New Zealand. Supply of 30,000 kVA 66/11 kV tapchanging oil immersed outdoor type transformer bank and spare unit for Bromley substation. Contract 294. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 21991/55).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 25 October

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	357	+3	282½
„ (3 months)	344½	+3½	262
R.S.T. (Rhodesian Selection Trust) group price*	360	—	—
LEAD, refined pig, min. 99·97% purity (cash)	107½	−½	111
„ (3 months)	107	−¼	103
TIN, refined, min. 99·75% purity (settlement)	767	+6	730
„ (3 months)	753	+4	728
ALUMINIUM, ingots 99·99·5%	171	—	150
ZINC, virgin, min. 98% purity (cash)	91	−1	81
„ (3 months)	90½	−1	80¾
RUBBER No. 1, RSS. spot (per lb.)	35¼d.	−¼d.	25d.
„ c.i.f. basis, ports. Dec. (per lb.)	35¼d.	—	23¼d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	56½	—	52½
Mild Steel Tape (0·04 in.)	43½	—	40½

(*Fixed price c.i.f. U.K., now subject to change at 24 hours' notice, to "consumers willing to instil a degree of stability into the resale price.")

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Modalite. 742,014. Class 11. Lighting fittings. Thorn Electrical Industries Ltd., 105/109 Judd St, W.C.1.

Picturetron. 733,766. Class 9. Cathode ray tubes. **Pyecam,** 741,061 and **Pyetel,** 741,067. Class 9. Scientific, radar apparatus, etc. Pye Ltd., Radio Works, St. Andrews Rd, Cambridge.

Houseproud in design. 734,471. Class 9. Suction cleaners. S.E.P. Ltd., 4 Eden St, Kingston-on-Thames.

Wesculite. 742,140. Class 9. Metal rectifiers. Westinghouse Brake and Signal Co., Ltd., 82 York Way, Kings Cross, N.1.

Telepic. 742,909. Class 9. Wave band selection switches. Bush Radio Ltd., 59 Oxford St, W.C.1.

Minnimaid. 743,011. Class 9. Suction cleaners and floor polishing machines. Vacuum Cleaner Supplies Ltd., 23/24 High Parade, S.W.16.

BUSINESS PROSPECTS

Home

Alva (Clackmannan) T.C. Scheme approved for 287 houses in western development.

Ayr T.C. Information to be collated on cost of overhauling electrical system at slaughterhouse.

Bath T.C. Construction of seven shops, each with maisonnette, and six flats in Weston High St. Architect, F. W. Beresford Smith, 2 Princes Buildings.

Belfast T.C. Application to be made to borrow £28,500 for construction of new trolleybus overhead line equipment.

Belfast. Factory to be built by Ministry of Commerce for Mission Manufacturing Co. of Houston, Texas.

Bletchingley (Sur). It is proposed to erect instalment (240 places) at county school. Estimated cost, £85,100.

Bournemouth. S.W. Metropolitan Hospital Board to erect new group offices at Royal Victoria Hospital. P. S. Rathbone is quantity surveyor.

Burton-on-Trent. Tenders may soon be invited for erection of Horninglow secondary modern school.

Camberwell. Architects for first stage of extensions to King's College Hospital Medical School, are Pite, Son and Fairweather, 6 Queen Anne's Gate, S.W.1. Cost estimated at £90,000.

Camborne (Corn). Five shops and a bank with showrooms and offices over to be built by Charterbridge Corpn. (Holdings) Ltd., 8a Eccleston St, London, S.W.1, in Trelowarren St and Commercial Sq. Quantity surveyors are Gleeds (Plymouth), Phoenix Chambers, Princess Sq, Plymouth.

Cardiganshire. Erection of extensions at Aberporth county primary school, near Cardigan. G. R. Bruce, County Architect, County Hall, Aberayron.

Chester T.C. Erection of Neston mixed secondary modern school. County Architect's Office, The Castle.

Dorking (Sur). It is proposed to erect instalment of girls' school, kitchen and dining room at Dorking mixed county school. Estimated cost £145,699.

Dorset. Bridport Bilateral school (£117,500), Sherborne modern school (£97,600) and Sturminster Newton modern school (£103,200) to be built during 1956-57.

Dudley (Worc). Further instalment of R.C. secondary modern school has been included in 1956-57 programme. Estimated cost £150,200.

Egham (Sur). It is proposed to erect £185,212 school at Royal Hythe Farm.

Ellesmere Port T.C. Construction of 197 houses on North Whitby estate. Borough Engineer and Surveyor, Queen St.

Essex. Erection of Rochford Hawkwell Holt junior school. H. Conolly, County Architect, County Hall, Chelmsford.

Contracts Placed

Barrow-in-Furness T.C. Electrical installation in Salthouse Flood Prevention scheme, N.W. Electricity Board, £1,624.

Dundee. Electrical work in Duncan of Jordanstone College of Art for Governors, Lowdon Bros. and Co. (Engineers) Ltd., £10,373.

Poole T.C. Installation of electricity at Longfleet school, Southern Electricity Board, £1,741.

Swindon T.C. Rewiring of Euclid St school, J. Lott and Sons, £1,783.

Falmouth (Corn) T.C. Tenders to be invited for erection of 47 houses on Dracaena Ave site.

Finchley (Middlx). Block of luxury multi-flats, 36 flats, 10 houses, etc. in Regent's Park Rd. Architects are Newman, Levinson and Partners, 9 Mansfield St, London, W.1.

Hatfield R.D.C. Erection of 30 houses on Redhall estate north. Architect, J. H. Parker, 82 Great North Rd.

Helensburgh T.C. It is proposed to erect 96 houses on Fernigair site.

Huddersfield. Proposed new secondary modern school at Salendine Nook is estimated to cost £219,600.

Kendal T.C. Construction of 68 houses on Hall Garth estate. J. Barnfather, Engineer and Surveyor, Municipal Offices, Lowther St.

Lewisham. Tenders may soon be invited by S.E. Metropolitan Hospital Board for first stage of rebuilding Lewisham Hospital. Estimated cost £200,000. Saxon, Snell and Phillips, architects, 9 Bentinck St, W.1.

Llangollen (Denbigh). Caldecot Press Ltd. to build factory adjoining Berwyn works. Architects are Venables and Williams, West Rd, Congleton, Cheshire.

Maidenhead T.C. Schemes for erection of municipal buildings on St. Ives site

Gazette Announcements

COMPANIES ACTS

E. Duckworth (Preston) Ltd. Meeting of creditors and contributories are to take place at Official Receiver's Office, 20 Byrom St, Manchester, on 2 Nov., at 11 a.m. and 11.30 a.m. resp.

Voluntary Liquidation

F. J. Coleman (Electrical Contractors) Ltd. At meeting of creditors statement of affairs submitted showing liabilities amounting to £3,929, of which £2,491 was due to trade creditors; £321 to expense and sundry creditors; and £1,116 on loan account. Assets estimated to produce £3,377, but after allowing £187 for preferential claims, and £24 due to debenture holder there were net assets of £3,165 or deficiency as regards creditors of £764. Company registered in Sept. 1949 with nominal capital of £4,000, of which £3,000 had been issued. Resolved to confirm voluntary liquidation with Mr N. W. Osborne, F.A.C, Rushton Osborne and Co., 11-12 Finsbury Sq, E.C.2, as liquidator, with committee of inspection.

Winding-up

C. Saunders and Co. (Electrical Contractors) Ltd. Winding-up order dated 20 Sept. Petition presented on 16 June. Meetings of creditors and contributories took place yesterday (26 Oct.).

BANKRUPTCY ACTS

Receiving Orders

Wigan. Henry Parkinson, trading as Electrolite Engineers at 9 Market St, Hindley, nr. Wigan. Date of receiving order, 14 Oct.

Burnley, Kenneth Hanson, trading as Hanson's Electronics at 2 Hall St, and 1 Parker Lane, Burnley. Date of receiving order, 18 Oct.

Appointment of Trustee

Bradford. Sam Shaw, electrical contractor, trading at 133 Leeds Rd, Bradford. Trustee is R. W. Hellyer, cert. acc., 3 Eldon Place, Bradford.

approved in principle. Cost estimated at £250,000. Architect is Guy North, 40 Broadway.

Padiham (Lancs). New factory costing £500,000 being planned by Glover and Main Ltd., 48 Grosvenor Gardens, London, S.W.1. Houston and Forbes, Manchester Hse, 30 Burnley Rd, are architects.

Paisley T.C. Dean of Guild Court has approved plans for erection of 338 houses.

Perth T.C. Construction of 100 flats in Letham Development. Burgh Surveyor, 16 Tay St.

Portsmouth. Scheme approved for technical high school for boys costing about £200,000. Also, two-storey TB unit proposed at St. James' Hospital, for which W. C. Andrew, 167 Victoria St, London, S.W.1, will probably be consulting structural engineer.

Reigate. It is proposed to erect instalment of mixed secondary school at Woodhatch which is estimated to cost £103,902.

Renfrewshire. Erection approved of 72 houses at Thornliebank, 40 at Newton Mearns, 48 at Neilston and 50 at Lichwinnoch. Estimated cost £329,495.

Rhyl (Flints). Approval sought by Clwyd and Deeside Hospital Committee for extension scheme at Royal Alexandra Hospital costing about £200,000.

Sedgley. Approval given to erection of offices, workshops and welfare centre for blind in Wolverhampton Rd, Springhill, for Instn. for Blind. Cost estimated at £125,000.

Southend-on-Sea T.C. Tenders may soon be invited for completion of £168,550 Cliffs Pavilion at Shorefields.

Southwell (Notts) R.D.C. Erection of 16 houses each at Ollerton and Edwinstowe. Architects, Wm. Saunders and Partners, 24 Castlegate, Newark.

Swaffham (Norf). Brocks Crystal Palace Fireworks Ltd., of Hemel Hempstead, are to erect factory in the district.

Walton-on-Thames. It is proposed to erect junior school and infants' school with kitchen and dining room at estimated cost of £83,876.

Co. Westmeath. Construction of 36 houses at Clonbrusk, Athlone. County Secretary, County Buildings, Mullingar.

Wortley (Yorks) R.D.C. Erection of 72 houses in St. Michael's Cresc, Ecclesfield. A. Wikeley, Council Offices, Grenoside, Sheffield.

Overseas

Canada. U.K. source of supply for small a.c. petrol or diesel engine driven generators sought by Foulis and Bennett Electric Ltd. of 4 Atlantic St, Halifax, Nova Scotia.

Holland. Representation of U.K. makers of electric dry shavers sought by J. Stellema, Prinsengracht 725, Amsterdam.

India. Aircraft electrical equipment is among items in which Roberts McLean and Co., Ltd., 31 Netaji Subhas Rd, Calcutta, are interested in obtaining representation of U.K. manufacturers.

Malaya. Henry Waugh and Co., Ltd., P.O. Box 260, N.T.S. Building, Cecil St, Singapore, want to represent U.K. manufacturers of electrical household appliances (including irons, kettles, immersion heaters, fans, etc.), and wiring accessories (including switches, plugs, main switches, conduits, 80 W fluorescent fittings, etc.).

MEETINGS TO NOTE

THURSDAY, 27 OCT.

A.S.E.E. (Kent). Annual dinner at Royal Star Hotel, Maidstone.

FRIDAY, 28 OCT.

I.E.S. (Bath and Bristol). Architects' Night. Royal Hotel, Bristol, 7 p.m.

I.E.S. (Birmingham). "Display Lighting." J. A. Barker. Regent Hse, St. Phillip's Place, Colmore Row, 6 p.m.

INCORP. PLANT ENGINEERS (Birmingham). "Oil Firing." K. J. Luntley. Imperial Hotel, 7.30 p.m.

ELECT. TRADES COMMERCIAL TRAVELLERS' ASSOC. (Midlands). Annual dinner at Queens Hotel, Birmingham.

I.E.E. (N. Staffs). "Proving Performance of Circuit-Breakers," J. Christie, H. Leyburn and J. F. Bird; "New Testing Station for High-Power Circuit-Breakers," J. Christie, H. Leyburn and R. W. Fenn. Technical College, Stafford, 7 p.m.

A.S.E.E. (Sheffield). Annual dinner dance at Devonshire Arms Hotel, Baslow.

MONDAY, 31 OCT.

I.E.E. (London Radio). Series of four papers beginning at 2.30 p.m. and a fifth at 5.30 p.m. Savoy Place, W.C.2.

BUSINESS EFFICIENCY EXHIB. opens at King's Hall, Belfast, closing on 5 Nov. Organisers: Office Appliance and Business Equip. Trades Assoc.

MANCHESTER ELECTRICAL SOC. Presidential address by T. E. Daniel. Hot pot supper. Waldorf Hotel, Cooper St, 6.15 p.m.

TUESDAY, 1 NOV.

I.E.E. (London Measurement). Discussion on "Fault Recording Instrumentation on a Power Supply System." W. Casson and Laszlo Csuros. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland). "Transatlantic Telephone Cable." M. J. Kelly, Sir Gordon Radley, G. W. Gilman and R. J. Halsey. Elect. Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N. Western). "Adhesion of Electric Locomotives." H. I. Andrews. Engineers' Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (S.E. Scotland). "Induction Generators." H. E. C. Clapham. Heriot-Watt College, Edinburgh, 7 p.m.

I.E.E. (Maidstone). "Possibilities of Cross-Channel Power Link between British and French Supply Systems." D. P. Sayers, M. E. Laborde and F. J. Lane. Prince of Wales Hotel, Railway St, Chatham, 7 p.m.

THE LIGHTMONGERS. Annual meeting and dinner at Carrs Restaurant, Strand, London.

INCORP. PLANT ENGINEERS (London). "Corrosion and Fouling in Industry." E. J. Bradbury. Royal Soc. of Arts, John Adam St, W.C.2, 7 p.m.

A.S.E.E. (Oxford and Reading). "Fluorescent Lighting, Colour Changing and Dimming." H. Hewitt. Elect Offices, 3 Market Place, Reading, 7 p.m.

A.S.E.E. (S.E. London). "Transformers." Congregational Church Hall, Court Rd, Eltham, 8 p.m.

A.S.E.E. (W. London). "Engineering in West Indies." H. Clifton. Windsor Castle Hotel, 134 King St, Hammersmith, 7.30 p.m.

A.S.E.E. (S. Wales). Film Show at Angel Hotel, Westgate St, Cardiff, 7.30 p.m.

WEDNESDAY, 2 NOV.

I.E.E. (London Students). "Communication of Information—Human, Animal and Machine." E. Colin Cherry. Savoy Place, W.C.2, 6.30 p.m.

I.E.E. (S.W. Scotland). "Design, Performance and Application of Miniature Circuit-Breakers." H. W. Wolff and T. G. F. Atherton. 39 Elmbank Cresc, Glasgow, 7 p.m.

I.E.E. (Southern). "Automatic Circuit Reclosers." G. F. Peirson, A. H. Pollard and N. Care. Elect. Offices, Hove, 6.30 p.m.

I.E.E. (Rugby). "Progress in Lamps and Lighting." H. R. Ruff and R. V. Mills. Crown Hotel, Banbury.

I.E.E. (Tees-side). "Manchester - Kirk o'Shotts TV Relay System." G. Dawson, L. L. Hall, K. G. Hodgson, R. A. Meers and J. H. H. Merriman. Cleveland Inst., Middlesbrough, 6.30 p.m.

I.E.S. (Edinburgh). "Artificial Lighting for Plant Growth." A. E. Canham. Y.M.C.A., 14 St. Andrews St, 6.15 p.m.

I.E.S. (Manchester). Annual dinner at Cafe Royal.

I.E.S. (Swansea). "Problems of Production Lighting in TV Studios." R. de B. McCullough. Elect Offices, The Kingsway, 6.30 p.m.

INST. OF WELDING. Autumn meeting. Annual dinner at Park Lane Hotel. Business session on 3 and 4 Nov. at Instn. of Civil Engrs., Great George St, S.W.1.

INCORP. PLANT ENGINEERS (Southern). "Industrial Fires and their Prevention." E. T. Hayward. Polygon Hotel, Southampton, 7.30 p.m.

INSTN. OF ENGINEERING INSPECTION (Birmingham). "Measurement for Production." S. F. Ellerby. Engineering Centre, Stephenson Place, 7.30 p.m.

A.S.E.E. (Manchester). Ramsey Lecture: "Radio Astronomy." Engineers' Club, Albert sq, 7.30 p.m.

A.S.E.E. (N. London). "Suppression of Interference." A. Hale. Queen's Head, 677 Green Lanes, Harringay, 7.45 p.m.

A.S.E.E. (Nottingham). Visit of national chairman and gen. secretary Mechanics Instn., Trinity Sq, 7.30 p.m.

THURSDAY, 3 NOV.

I.E.E. (London). "New High-Frequency Transmitting Station at Rugby." Capt. C. F. Booth and B. N. MacLarty. Savoy Place, W.C.2, 5.30 p.m.

I.E.S. (Cardiff). "Problems of Production Lighting in TV Studios." R. de B. McCullough. Elect. Offices, The Hayes, 5.45 p.m.

I.E.S. (Glasgow). "Maintenance of Lighting Installations." J. W. Strange and W. Robinson. 39 Elmbank Cresc, 6.30 p.m.

I.E.S. (Nottingham). "Lighting of Hazardous and Corrosive Locations in Industrial Plants." W. E. Harper and A. G. Palmer. Elect. Offices, Smithy Row, 6 p.m.

CHELMSFORD ENGRNG. SOC. "Kemano Hydro-Electric Development and Kitimat Aluminium Reduction Works." F. L. Lawton. Hoffman's Hall, 7.30 p.m.

BRITISH INSTN. OF RADIO ENGS. (N. Western). "Ground Controlled Approach and Instrument Landing System." R. H. James and N. MacKinnon. College of Technology, Sackville St, Manchester, 6.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Birmingham). Film evening including two by Babcock and Wilcox and one by Dewrance. Engineering Centre, Stephenson Place, 6.30 p.m.

A.S.E.E. (S. London). "Electricity in Operating Theatres." Half Moon Hotel, Broad Green, Croydon, 8 p.m.

FRIDAY, 4 NOV.

ASSOC. OF ELECT. MACHINERY TRADES. Annual ball at Savoy Hotel, London.

E.C.A. (London). Annual dinner and dance at Grosvenor Hse, Park Lane, London.

A.S.E.E. (N.W. London). Branch dinner and dance at Century Hotel, Wembley Park, 7.30 p.m.

A.S.E.E. (Liverpool) "Electrostatic Precipitation." J. A. Quarrington. Engrng. Soc., 9 The Temple, 24 Dale St, 7.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Howard's (Exeter) Ltd. To take over business of radio, electrical, television and refrigeration engineers carried on as "Howards" at 90 Sidwell St, Exeter, and 5 Exeter Rd, Exmouth. Nom. cap.: £20,000. Dirs.: R. Howard, L. A. G. Satterley and J. Aplin.

Graham Bros. (Electrical Engineers) Ltd., Zetland Place, Middlesbrough. Nom. cap.: £20,000. To take over business carried on at Middlesbrough as "Graham Bros." Dirs.: H. J. A. Graham, C. P. Graham and Katherine B. Graham.

Richardsons (Kew) Ltd. 1a Mortlake Terr, Kew, Surrey. Manufacturers of and dealers in domestic, furnishing, building and general hardware and ironmongery, electric and gas fittings, etc. Nom. cap.: £2,000. Dirs.: K. Richardson and Mrs F. E. Vincent.

Refrigerated Constructions and Assemblies Ltd. 252 Watford Way, Hendon, N.W.4. Cold Storage, refrigerating, heating, ventilating and air conditioning engineers, etc. Nom. cap.: £1,000. Dirs.: M. Leigh, R. Dutton, F. Sadler and Miss F. Gurney.

Wilkinson and Jackson Ltd. 27 Union St, Bury. Boiler seating engineers, boiler, mechanical, electrical, marine, motor and general engineers, etc. Nom. cap.: £5,000. Marion Wilkinson, 36 Seedfield Rd, Bury, signs as director.

Plessey Development Co., Ltd. To establish companies and associations for prosecution or execution of undertakings, works, projects and enterprises of all kinds. Power is taken to carry on business of electricians, electrical and electronic engineers, etc. Nom. cap.: £100,000. Dirs.: to be appointed by subs. Subs.: Winifred J. Pearmain, 21 Hazlemere Gdns, Hornchurch, Essex, and A. P. R. Mapplebeck, 9 Nevern Mansions, Nevern Sq, S.W.5.

William Gartside (Rossendale) Ltd., 13 Kay St, Rawtenstall, Rossendale, Lancs. Manufacturers of and dealers in artificial lighting apparatus, electrical plant, wireless and television sets, etc. Nom. cap.: £2,000. Dirs.: R. Cunliffe, Mrs V. Cunliffe, R. H. Shingles and S. Shingles.

Heslop and Co., Ltd., 13 Bloomsbury Sq, W.C.1. Manufacturers of and dealers in electronic equipment, etc. Nom. cap.: £100. Dirs.: J. D. Heslop, Mrs M. E. Heslop and A. J. Richards.

D. G. Stewart Ltd. Wireless, television and electrical equipment retailers at 155 Long Lane, Bexleyheath, Kent. Nom. cap.: £100. Permt. dirs.: D. G. Stewart and J. E. Ewens.

Norwoods Radio Ltd., 62 Norwood High St, S.E.24. Radio and television engineers, manufacturers of and dealers in radio, television and electrical accessories, etc. Nom. cap.: £500. Dir.: R. E. Perkins.

Fallas Electrical Co., Ltd., 4 New Burlington St, W.1. Nom. cap.: £1,000. Dirs.: J. R. Callaghan and T. H. Godsmark.

Trade Note

Change of Address. Dallow Lambert and Co., Ltd., have now moved to Thurmaston, Leicester. Telephone Syston 86931.

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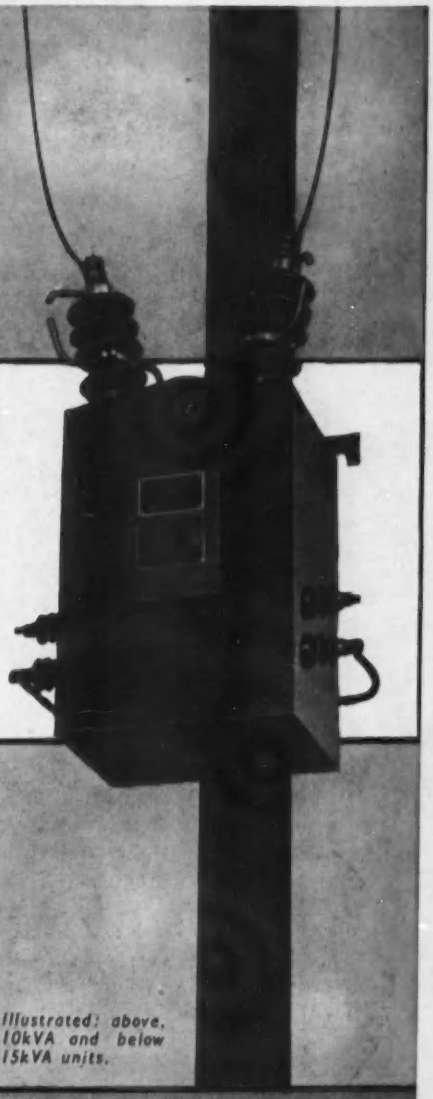

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Available 2½, 5, 10 and 15 kVA, single phase, at two standard ratios of 11,000/250 and 6,600/250 volts. Standard low voltage tappings at plus and minus 5%. Hermetically sealed—completely weatherproof. Send for Publication D.B.30.

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD.
Walton-on-Thames, Surrey, England

Telephone: Walton-on-Thames 760 (8 lines)
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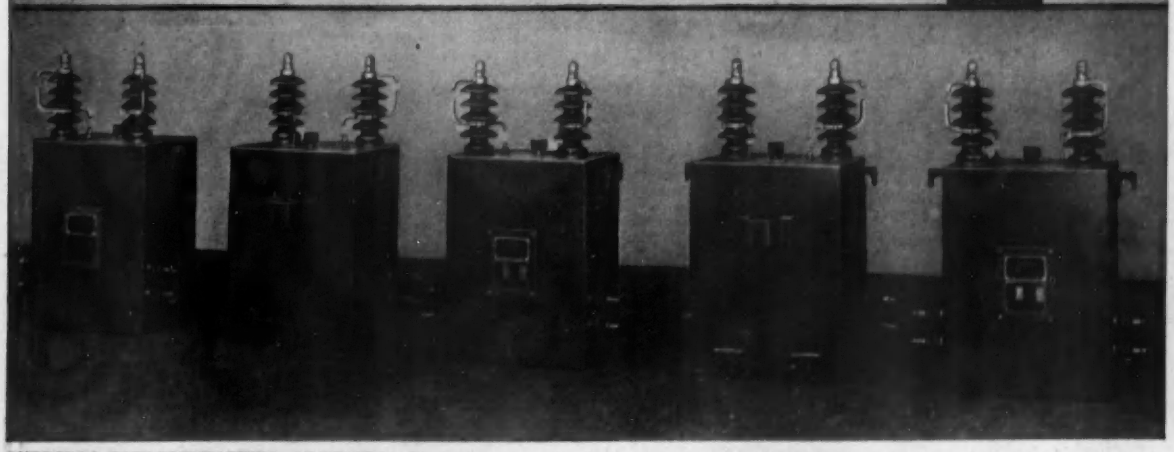
Illustrated: above, 10kVA and below 15kVA units.

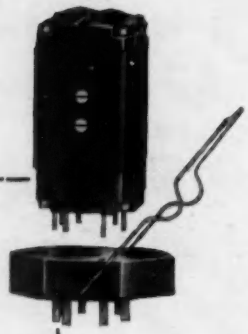


OVERSEAS REPRESENTATIVES: ARGENTINA: H. A. Roberts & Cia., S.R.L., Buenos Aires. **AUSTRALIA:** Hackbridge and Hewittic Electric Co. Ltd., Sydney. **SOUTH AUSTRALIA:** Parsons & Robertson Ltd., Adelaide. **BELGIUM & LUXEMBOURG:** M. Dorfman, 124 Avenue des Cerisiers, Woluwé, 1, Brussels. **BRAZIL:** Oscar G. Mors, Caixa Postal 1280, Sao Paulo. **CANADA:** Hackbridge & Hewittic Electric Co., of Canada, Ltd., Montreal. **CEYLON:** Envee Ees Ltd., Colombo. **CHILE:** Ingenieria Electrica S.A.C., Santiago. **EAST AFRICA:** Gerald Hoe (Lighting) Ltd., Private Bag, Nairobi. **EGYPT:** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND:** Sähkö-ja Koneliike O.Y. Hermes, P. Esplanaadikatu 37, Helsinki. **HOLLAND:** J. Kater E.I., Ouderkerk a.d. Amstel, Amsteldijk Noord 103c. **INDIA:** Steam & Mining Equipment (India) Ltd., Calcutta; Easun Engineering Co. Ltd., Madras, 1. **IRAQ:** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO:** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NEW ZEALAND:** Richardson, McCabe & Co. Ltd., Wellington, etc. **PAKISTAN:** James Finlay & Co. Ltd., Karachi. **SOUTH AFRICA:** Fraser & Chalmers (S.A.) (Pty.) Ltd., Johannesburg. **RHODESIA:** Fraser & Chalmers (S.A.) (Pty.) Ltd., Salisbury, etc. **THAILAND:** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO:** Thomas Peake & Co., Port of Spain. **TURKEY:** Dr. H. Salim Öker, 43, Posta Caddesi, Ankara. **URUGUAY:** H. A. Roberts & Cia., S.A.U., Montevideo. **U.S.A.:** Electro Machinery Corporation, 50 Broad Street, New York, 4.

Weston *Moving Coil* Relays

FOR A WIDE VARIETY OF APPLICATIONS

The simplicity and reliability of relay control has led to the ever increasing use of WESTON MOVING COIL RELAYS. Let us have a note of your relay problems and we will be pleased to advise on the most suitable model for any set of conditions. Enquiries should be accompanied by full particulars of both control and local circuits.



MODEL S115. A relay of extremely small size, functioning as an 'on-off' switch. Can be operated on a power input as low as 5 microwatts.

MODEL S54. A relay of extreme sensitivity with wide applications in Laboratory and Industrial Control. The high torque developed by the moving system ensures positive contact pressure.

MODEL S124. A highly sensitive relay with magnetic hold-on contacts having a higher rating than those of the above models.

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SW 1

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all their classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

CITY AND COUNTY OF LICHFIELD

GROUP "A" STREET LIGHTING
EXETER-LEEDS TRUNK ROAD, A.38
FROM THE TRAFFIC LIGHTS TO TRENT VALLEY STATION

TENDERS are invited for the supply, erection and installation of 45 Fluted Steel Columns for 45 Sodium Lanterns together with 8 Wall Brackets for 8 Fluorescent Lanterns.

Application for Contract Documents should be made to the City Engineer and Surveyor, Mr D. Oglesby, M.I.MUN.E., M.R.SAN.I., Guildhall, Lichfield.

Applications must be accompanied by a Deposit of Two Guineas which is returnable on receipt of a bona fide Tender not subsequently withdrawn.

Tenders in a plain sealed envelope endorsed "Street Lighting" must be received by the undersigned not later than noon on Monday, 14 Nov., 1955.

The Council does not bind itself to accept the lowest or any Tender.

HENRY J. CALLENDER,
Town Clerk.

Guildhall,
Lichfield.
19 Oct., 1955. (V 637)

SOUTHAMPTON C.B.C.

invites tenders from Electrical Contractors for electrical installation at Thornhill Junior and Infants' School to be Sub-Contract with Main Contractor (R.I.B.A. Contract plus Supplemental Conditions available for inspection). Forms and particulars from Borough Architect on £1 deposit by 31 Oct., 1955, refunded on receipt of bona fide Tender not subsequently withdrawn, or return of documents. Tender to the Borough Architect, Civic Centre, Southampton, by 10 a.m. on 15 Nov., 1955. (V 621)

FEDERAL HYDRO-ELECTRIC BOARD OF RHODESIA AND NYASALAND

KARIBA HYDRO-ELECTRIC SCHEME

THE Federal Hydro-Electric Board propose to call for tenders for the transmission work associated with the Kariba Scheme which involves the construction of about 900 miles of 330 kV single circuit, flat spacing steel tower transmission lines. Twin 0·35 sq in. copper equivalent steel cored aluminium conductors will be used for each phase. The two earth wires will be of galvanised steel. The approximate span length will be 1,100 ft and counterpoise earthing will be employed where considered desirable.

Much of the route lies through bush country and the contracts will include clearance of the servitudes. The survey for tower positioning will, however, not be included in the contracts. The line routes will be from Kitwe, Northern Rhodesia to the Kariba Power Station, from the Power Station south to Norton near Salisbury and to Umniati and finally from Salisbury to Norton to Umniati to Bulawayo.

For tender purposes the work will be split into three parts and Tenderers will be required to quote for each part separately and also for all three parts jointly.

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Contractors who may be interested in tendering should submit full details of their qualifications and experience by 30 Nov., 1955, after which tender documents and drawings will be issued to those contracting organisations who satisfy the requirements of the Board.

Details of qualifications and experience should be sent in duplicate to The Secretary, Federal Hydro-Electric Board, P.O. Box 630, Salisbury, Southern Rhodesia, with a copy to The Mechanical and Electrical Consulting Engineers, Merz and McLellan, Carliol House, Newcastle-upon-Tyne 1, England. (V 640)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following posts.

SENIOR DRAUGHTSMAN,
WESTERN SUB-AREA
Ref.: PER/V/2063/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil engineering design, engineering drawing, plant layout in substations. In addition the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

The post is graded under Schedule "D" of the National Joint Board agreement as Grade 5—£672/£777 per annum, inclusive of London Allowance.

ENGINEERING DRAUGHTSMAN,
WESTERN SUB-AREA
Ref.: PER/V/2064/T

Candidates should have had a good general and technical education and be experienced in drawing office routine, electrical diagrams, mains survey and recording of mains work, and layout of plant in transformer chambers.

ENGINEERING DRAUGHTSMAN,
CHIEF ENGINEER'S DEPARTMENT
(DRAWING OFFICE)
Ref.: PER/V/1989/T

Applicants should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. switchgear and cables.

The posts of Engineering Draughtsmen are graded under Schedule "D" of the National Joint Board agreement, as Grade 6—£535. 10s./£661. 10s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7, New Broad St, London, E.C.2, to be returned completed by 12 Nov., 1955. Please enclose addressed envelope and quote appropriate reference number of vacancy preferred, as indicated above. (V 605)

SENIOR SCIENTIFIC OFFICERS AND SCIENTIFIC OFFICERS

required by

THE ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON, BERKSHIRE

TO study problems associated with the production and acceleration of charged particles. Applicants should hold a first or second class Honours degree in Physics or Electrical Engineering, or have equivalent qualifications. Experience in any of the following fields would be an advantage: Spark and arc discharge phenomena, plasma research, particle acceleration.

Applicants for the senior posts should have at least 3 years post graduate research experience.

Salary: SENIOR SCIENTIFIC OFFICER —£1,105/£1,270 per annum (male). SCIENTIFIC OFFICER (starting salary assessed in accordance with age, qualifications and experience in the range of £528/£948 per annum (male).

Contributory Superannuation Scheme. Successful married officers now living outside the Establishment's transport area will be eligible for housing on one of the Authority's estates; until housed a lodging allowance may be payable.

Requests for application forms by postcard to Senior Recruitment Officer at the above address, quoting Reference 782/49. (V 601)

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER (Operation and Maintenance)—Surrey Sub-Area Headquarters, Dorking.

Salary £515/£560 per annum in accordance with N.J.B. Grade 17, Class K. Superannuable. Applicants of at least H.N.C. standard should have had a sound training in electrical distribution. Duties will chiefly consist of assisting in plant maintenance and the testing and commissioning of system protection. A knowledge of, or interest in, the latter would be an advantage.

Applications, naming two referees, on forms from C. W. Hughes, B.SC., M.I.E.E., Surrey Manager, SEEBoard, Rough Rew, Horsham Rd, Dorking, by 9 Nov., 1955.

A. L. BURNELL,
Secretary.
(V 652)

CITY COUNCIL OF SINGAPORE

Electricity Department

APPLICATIONS are invited for appointment of TECHNICAL ENGINEER on Agreement for two periods each of 3 years' resident service.

Applicants must be (*a*) Corporate Members of the I.E.E. and (*b*) possess an Engineering Degree. They must have experience in technical planning and design associated with modern H.P. Steam Power Stations, High Voltage Networks and Substations, etc.. Specifications for steam plant and auxiliary equipment; generation plant; H.V. Cables, Transformers, Switchgear, etc. Testing of High and Low Voltage Electrical equipment; Network calculations and protection equipment associated with a large electricity supply undertaking. Minimum age 30 years.

The basic salary scale of the post is $1,235 a month rising by annual increments of $45 to $1,325 a month ($1 Malavan = 2s. 4d.). Expatriation and Variable Allowances are also payable. Total emoluments on the basic salary of $1,235 a month including current allowances are $1,600 a month (£2,240 per annum) for a single man, $1,690 a month (£2,366 per annum) for a married man with no children and $1,830 a month (£2,562 per annum) for a married man with one or more children.

Partly furnished quarters provided, if available. Free passages for officer appointed and family subject to certain limits. Home leave after each 3 year period of resident service. Contributory Provident Fund.

Further details from the Council's London Agents: Messrs Allen and Williams, 1 Victoria St, London, S.W.1. Closing date for full applications in duplicate, Thursday, 17 Nov., 1955. (V 653)

THE ELECTRICITY COMMISSION OF NEW SOUTH WALES

INSTRUMENTS ENGINEER

APPLICATIONS are invited for the position of Instruments Engineer in the Generation Division of the Electricity Commission of New South Wales.

The appointee will be required to discharge the following responsibilities:

(*a*) The organising, establishing and equipping of a power station instruments section with a central instruments workshop.

(*b*) The control and supervision of the servicing and maintenance of instruments in all of the Commission's power stations.

(*c*) The conduct of investigations and the submission of recommendations associated with instrumentation problems in power stations.

(*d*) The submission of recommendations in regard to the instrumentation of large new power stations.

The Commission is responsible for the generation and bulk transmission of electricity on a system of approximately 1,400,000 kW capacity and serves an area of approximately 100,000 sq miles. Its plant is mostly thermal, coal fired, with a small proportion of hydro and diesel plant.

It is essential that applicants possess extensive experience in power station instrumentation and it is desirable that they be Engineers with the qualifications and experience which would entitle them to associate membership of a recognised professional Institution.

The appointee will be required to reside in Sydney, New South Wales, and reasonable travelling and other expenses will be paid for himself and his family.

The appointee will be required to contribute to the New South Wales State Superannuation Fund and to pass a medical examination.

The salary offered for the position is within the range £A1,800/£A2,028 per annum (at present approximately £E1,440/£E1,620) dependent upon qualifications and experience.

Applications for this vacancy should be forwarded to, and further information may be obtained from F. Sykes, Esq., The Electricity Commission of New South Wales, c/o Central Electricity Authority, Bankside House, Sumner St, London, S.E.1. Closing date for receipt of applications 11 Nov., 1955. (V 623)

MIDDLESEX COUNTY COUNCIL

County Architect's Dept.

ELECTRICAL ENGINEERING ASSISTANT

required APT. 11 (£560/£640 per annum plus London Weighting 21-25 years £20, 26 and over £30). For drawing office work in connection with wiring of buildings. Commencing salary according to qualifications and experience. 5-day week. Established, pensionable. Subject to medical assessment and prescribed conditions. Application forms (stamped addressed f'cap envelope) from County Architect, 1 Queen Anne's Gate Buildings, Dartmouth St, S.W.1, returnable by 8 Nov. (Quote R.525 E.T.) Canvassing disqualifies. (V 603)

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A.

ASSISTANT ENGINEERS (3 VACANCIES)
FULHAM GENERATING STATION

Vacancy No. 55/844

Applicants should have received sound technical training, preferably to H.N.C. or equivalent standard and have had experience in Power Station operation or maintenance. Salary—Class K, Grade 15=£624. 15s. per annum including London Allowance.

Applications, quoting vacancy number, may be made on form available from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (V 625)

EMPRESA NACIONAL de TELECOMUNICACIONES

Republic of Colombia, South America

A CHIEF RESIDENT ENGINEER and a DEPUTY CHIEF RESIDENT ENGINEER required for the supervision and administration of contracts for the installation of multi-channel V.H.F. and S.H.F. radio links for telegraph and telephone networks and also telecommunication equipment in the Republic of Colombia. The radio links to be installed will extend existing communications between large centres of population and provide for new developments in radio and allied installations to meet the present and future requirements in Colombia.

The period of engagement will be 3 years.

The salary of the Chief Resident Engineer will be U.S. $1,400 per month and that of the Deputy Chief Resident Engineer U.S. $1,260 per month (£6,000 and £5,400 per annum, respectively at 2·8 U.S.A. Dollars to £1). 40% of the salaries will be paid in Dollars of the United States of North America and 60% in Colombian currency at the legal rate of exchange on the date of the payments. (Present rate of exchange 2·5 Colombian pesos to U.S. $1.) Free passages will be provided for the successful applicants and their families not exceeding four persons besides himself in respect of each officer, to Bogotá, where they will be required to reside. Travel on duty outside Bogotá or Colombia will be necessary from time to time and actual travel costs of the officers appointed will be paid, together with a daily living allowance.

Applicants for the senior post should have held positions of senior responsibility and have a wide experience of telecommunication work with special experience of multi-channel V.H.F. and S.H.F. radio work. Applicants for the second post should have a thorough knowledge of telecommunication work with special experience of automatic trunk working and of the installation of telecommunication equipment. Applicants should be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications, and preferably have had experience in the supervision of important works carried out by contractors overseas. A knowledge of Spanish is desirable.

Applications giving full details of training and experience should be submitted in triplicate, with three copies of testimonials, to the Consulting Engineers:

PREECE, CARDEW AND RIDER,
8, 10 and 12 Queen Anne's Gate,
Westminster, London, S.W.1.
(V 641)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

ASSISTANT ENGINEERS required in the Board's Head Office in Edinburgh. Candidates should have experience in the construction and operation of power stations and a sound technical education and training. In addition to experience of hydro and steam plants, experience on diesel generation would be useful.

Salary would be in the range £750/£1,000 (N.J.B. Schedule C. Class AX, Grades 4/3) with placing according to training and experience. Superannuation Scheme applicable.

Applications stating age, qualifications and experience to be forwarded to The Secretary, North of Scotland Hydro-Electric Board, 16 Rothesay Terr, Edinburgh 3, within 21 days from the publication of this notice. (V 639)

THE NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER,
SOUTH DISTRICT, CHEADLE

THE duties will include the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, and switching operations on the H.V. and L.V. systems within the District as required. Corporate Membership of the I.E.E. will be considered an advantage.

Salary Scale: £755 x £15—£800 per annum, Grade F.7, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 5 Nov., 1955. (V 628)

SOUTH OF SCOTLAND ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS

APPLICATIONS are invited for positions as General Assistant Engineers in the Board's Generating Stations in the Glasgow Area.

Applicants should hold preferably a Higher National Certificate in either Mechanical or Electrical Engineering, or be pursuing a course of studies to obtain this or an equivalent qualification.

The duties will give young engineers a wide experience in the operation and maintenance of large power stations.

Positions are superannuable and the salary will be within the range, £475/£515, being in National Joint Board, Schedule A.

Applications on Forms AE6 should be sent to the Secretary, South of Scotland Electricity Board, 351 Sauchiehall St, Glasgow C.2, before 4 Nov., 1955

J. MEEK,
Secretary.
(V 636)

SOUTH WALES ELECTRICITY BOARD

require COMMERCIAL ASSISTANT (Contracting), District 348 (Cardiff) Central Sub-Area.

Applicants must have had experience in the preparation of and quoting for all classes of Technical Installation work including Domestic, Commercial and Industrial premises.

Salary—Class E, Grade 10 (£595/£640) of the N.J.B. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees to be addressed to the Secretary (Establishments Section) to arrive by 3 Nov., 1955.

D. G. DODDS,
Secretary.
St. Mellons,
Cardiff. (V 649)

SOUTHERN ELECTRICITY BOARD

AGRICULTURAL ASSISTANT

NO. 3 (Portsmouth) Sub-Area Commercial Department. Salary N.J.B. Class K, Grade 10, commencing at £790 per annum. N.J.B. Conditions of Service.

Candidates should have a sound knowledge of the application of electricity in Agriculture and Horticulture and be capable of preparing estimates for wiring installations and equipment, conducting negotiations, obtaining new business and giving talks to agricultural organisations. The possession of suitable technical qualifications would be an advantage.

The successful candidate will be required to contribute to the C.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 11 Nov., 1955. (V 646)

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post:

FOURTH ASSISTANT ENGINEER (ELECTRICAL)—TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS

Salary Class AX/DX, Grade 6, £600 x £25—£725/£785 per annum plus London Weighting.

The commencing salary for the above post will depend upon the qualifications and experience of the successful applicant.

Applicants should preferably hold a Graduate Membership of the Institution of Electrical Engineers and have experience in the construction or operation and maintenance of high voltage overhead lines, cables and substation equipment.

Forms of application may be obtained from the Authority's Headquarters or from any Divisional Office of the Authority, and should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14, by 12 Nov., 1955.

W. N. C. CLINCH,
Controller.
(V 627)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Fens Sub-Area, Peterborough

SERVICE CENTRE ASSISTANT
(MALE OR FEMALE)
133/55.R

Salary—N.J.C. Higher General Clerical Scale or General Clerical Scale, according to educational qualifications.

Apply by letter within 7 days to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

Essex Sub-Area Headquarters, Nr. Brentwood

FOURTH ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
177/55.N

Candidates should have had a good general and technical education and possess Higher National Certificate. Experience in the carrying out of switching operations, testing and commissioning of protective gear and fault investigation in the field on mains and plant will be an advantage.

Salary—N.J.B. Class K, Grade 13 (£675/£720) plus London Weighting.

Apply by letter within 14 days to the Engineer, Essex Sub-Area, Eastern Electricity Board, "Millfield," Bentley, Nr. Brentwood, Essex. (V 656)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN required in the No. 4 Sub-Area Headquarters, Electricity House, Rhostyllen, near Wrexham.

Salary within the range £510/£630 per annum (N.J.B. Schedule D, Grade 6).

Candidates should be experienced in one or more of the following subjects: Building and Civil Engineering Design, Engineering Drawing, Structural Steelwork Design, Overhead Line Design. Possession of at least the Ordinary National Certificate in Electrical Engineering desirable.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager at the above address. Closing date: 7 Nov., 1955. (V 630)

ELECTRICAL AND MECHANICAL ENGINEER

required by Basrah Port Directorate Iraq for one year in first instance. Total emoluments equivalent to £1,488 rising to £1,792 a year, including salary, allowances and Government Provident Fund contributions. Free passages. Liberal leave on full salary. Candidates must be Graduates of the Institution of Electrical Engineers or equivalent and must be experienced in the operation of medium sized electricity undertakings and in erection and maintenance of HT and LT overhead and underground systems, A.C. distribution systems and substation plant. Small diesel power station experience would be useful. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/30334/EE. (V 645)

TECHNICAL ASSISTANTS
Grade II

required for the Electrical Branch Public Works Department, Kenya, for one tour of 36 to 45 months on contract. Salary scale (including Inducement Pay and present temporary allowance of 10%) £772 rising to £1,122 a year. Initial salary according to experience. Gratuity at rate of £94/£137 a year. Outfit allowance £30. Free passages for officer and wife and assistance towards cost of children's passages. Liberal leave on full salary. Candidates, not over 40, should have served an apprenticeship with a firm of electrical contractors or with an Electricity Undertaking on installations work and have had good subsequent experience. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40581/EE. (V 602)

MANCHESTER CORPORATION TRANSPORT DEPARTMENT

TECHNICAL ASSISTANTS

required for Chief Engineer's Section; experience in Road Passenger Transport desirable for posts (*a*) and (*b*).

(*a*) MECHANICAL — Salary £650/£755 per annum, minimum qualification: Final Examinations of the Institution of Mechanical Engineers.

(*b*) ELECTRICAL — Salary £650/£775 per annum, minimum qualification: Final Examinations of the Institution of Electrical Engineers.

(*c*) ELECTRICAL — National Scales, A.P.T. II, £560/£640 per annum. Candidates should possess the Higher National Certificate or equivalent, and have some practical training.

Details of the duties and forms of application obtainable from the General Manager, Corporation Transport Department, 55 Piccadilly, Manchester 1, to whom the completed forms with the names of two referees should be returned not later than 7 Nov., 1955. Canvassing is prohibited.
19 Oct., 1955. (V 612)

HER MAJESTY'S OVERSEA CIVIL SERVICE
Electrical Engineer, Electricity Department Gambia

DUTIES are to take charge of electricity undertakings in the Colony.

Appointment is pensionable in the salary range £822/£1,638 per annum gross. Government quarters are provided, if available, at a low rental. Free first class passages are provided for the officer, his wife and up to 2 children under 18 years of age, or an annual allowance for their maintenance in the United Kingdom.

Candidates should be A.M.I.E.E. or have passed or be exempt from Sections A and B of the Institution's examination. They should have served an apprenticeship and have experience of C.I.*Oil engines up to 1,500 b.h.p. and a.c. electrical generation and distribution, L.T. and H.T. They should also have experience in the construction, erection and installation of overhead lines, underground cable network and outdoor and indoor substations for voltages up to 11 kV.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD 145/12/01. (V 670)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required in the Oswestry District of the Board's No. 4 Sub-Area. Salary within the range £715/£760 per annum (N.J.B. E/7). Applicants should have experience in design, construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from The Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham, should be completed and returned as soon as possible. (V 467)

SOUTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER (CONSTRUCTION)—BARNSTAPLE

SALARY N.J.B. Class D, Grade 7—£675 x £15 to £720.

Duties include general assistance in the Engineering Department and in the construction and operation of H.V. and L.V. substation equipment and H.V. and L.V. o/h and u/g mains.

Possession of the H.N.C. or equivalent qualifications in Electrical Engineering and a current driving licence is necessary.

The successful candidate will be required to undertake standby duties and to reside in Barnstaple.

Application forms obtainable from the Manager, Electricity House, The Parade, Taunton, to be returned by 8 Nov., 1955. (V 638)

THE FIRE PROTECTION ASSOCIATION

has the following vacancy: MECHANICAL or ELECTRICAL ENGINEER (age 23-26) with degree, or H.N.C. and GRAD.I.MECH.E. or A.M.I.E.E. and practical experience, to study fire hazards and the whole field of fire protection in relation to all types of industrial processes, and industrial heating and electrical equipment.

This appointment involves a detailed study of causes and methods of prevention of fire, the preparation of reports and advising clients. The successful candidate will have the opportunity to show initiative; after a period of training he will work largely on his own but within a team engaged on similar work on other aspects of fire protection. Salary will be commensurate with qualifications and experience. Non-contributory pension scheme. Applications marked "Private" and giving full particulars and salary required to the Secretary, 15 Queen St, London, E.C.4. (V 462)

CITY OF PORT ELIZABETH
Electricity Department

VACANCIES FOR METER TESTERS

APPLICATIONS are invited for three permanent positions of Meter Testers, fully experienced in Testing Department duties, including Polyphase circuit metering of K.W.H., K.V.A., and R.K.V.A. values, standardising of instrument transformers and indicating instruments, etc.

Inclusive weekly wage at present level of Cost of Living Allowance is £14. 14s. rising to £15. 13s. 2d. for married persons and £12. 12s. rising to £13. 10s. 2d. for single persons. Further details re hours of work, allowances, leave, Pension Fund, etc., are obtainable from the undersigned.

DAVIS AND SOPER LTD.,
Agents to the City Council
of Port Elizabeth.
52 and 54 St. Mary Axe,
London, E.C.3.
24 Oct., 1955. (V 669)

LEEDS COLLEGE OF TECHNOLOGY

Principal: C. Chew, M.SC., TECH.F.R.I.C.
DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS

APPLICATIONS are invited for the post of Assistant Lecturer in Electrical Engineering subjects, duties to commence as soon as possible.

Applicants should possess recognised technical qualifications in installation technology with practical experience in electrical installation or maintenance work. Teaching experience would be an added recommendation.

Salary will be in accordance with the Burnham Technical Scale, Grade A, i.e. £450 x £18 to £725 per annum, with full allowances for training, industrial and teaching experience.

Further particulars and form of application to be returned by 12 Nov., 1955, may be obtained by sending a stamped addressed envelope to The Chief Education Officer, Education Department, Leeds, 1. (V 668)

TECHNICAL INSTRUCTOR
(Electrical)

required by the Government of the Western Region, Nigeria, for two tours of 18/24 months or three tours of 10/12 months. Option of appointment either (*a*) on agreement with prospect of permanent and pensionable employment in salary scale (including expatriation pay) £750 rising to £1,175 a year, or (*b*) on temporary contract in salary scale (including expatriation pay) £807 rising to £1,269 a year with a gratuity (resettlement grant) at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates must have served an apprenticeship and have had good subsequent experience in electrical installation and practice. They must hold a Full Technological or Final City and Guilds Certificate in Electrical Installation work or Electrical Engineering Practice. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/40808/EE. (V 611)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Southport District.

Salary within the range £635/£680 per annum (N.J.B. E/9).

Applicants must have received a thorough technical training and have the appropriate technical qualifications.

Duties will be concerned with the construction and operation of h.v. and m.v. networks and substations.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3. Closing date: 7 Nov., 1955. (V 629)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (CHELTENHAM DISTRICT)

Applicants should possess a sound technical training and have a wide practical experience of industrial, commercial and domestic installations and their electrical requirements. The duties include negotiations with consumers, preparation of estimates, etc., planning and supervision of contracting work, advice on utilisation with particular reference to industrial consumers. Experience of appliance repairs would be an advantage. Technical qualifications desirable. Salary £675/£720 per annum (N.J.B. Grade E.8).

ASSISTANT WAYLEAVE OFFICER (CHIPPING SODBURY DISTRICT)

Duties include assistance in simple survey and plotting of routes for proposed overhead lines. Experience desirable. Salary £425/£525 per annum (N.J.C. Grade 1).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

Birmingham and District Sub-Area

SUBSTATIONS FOREMAN (N.W. BIRMINGHAM DISTRICT)

Applicants must have a wide experience in Installation, Repair and Maintenance of High Voltage and Medium Voltage Switchgear, Transformers, Rotary Convertors and Rectifiers, and must be capable of supervising men engaged on this type of work. Conditions and salary—£645 per annum (Grade 1, Schedule E) in accordance with N.J.I.C. Agreement.

Apply in writing, within fourteen days, stating age, experience, to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

Shropshire and Hertfordshire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (SHREWSBURY DISTRICT)

The successful applicant will be required to assist in the construction and maintenance of E.H.V. and L.V. Overhead and Underground Mains. Technical qualifications desirable. Salary £595/£640 per annum (N.J.B. Grade E.10).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

GENERAL ASSISTANT DISTRICT ENGINEER (LUDLOW DISTRICT)

The successful applicant will be required to assist in the construction and maintenance of E.H.V. and L.V. Overhead and Underground Mains. Technical qualifications desirable. Salary £515/£560 per annum (N.J.B. Grade D.11).

Apply in writing, within fourteen days, stating age, experience, present salary and position to District Manager, Midlands Electricity Board, Bull Ring, Ludlow.

Worcester and District Sub-Area

DEMONSTRATOR (FEMALE) (KIDDERMINSTER DISTRICT)

Applicants must have had a good education and should have a certificate of a recognised Domestic Training College and/or the

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E.A.W. Certificate. Duties include lecture demonstrations and advising consumers on the selection and use of electrical appliances. Salary £425/£525 per annum (N.J.C. Grade 1).

Apply in writing, within fourteen days, stating age, education, qualifications, and experience, to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
(V 655)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

Castleford District
DISTRICT MANAGER

APPLICANTS should have experience in the Industry of management and organisation in an industrial area with surrounding urban and rural districts. The person appointed will be required to be responsible for all engineering and commercial work in the Castleford District.

Salary—N.J.M. 2, £1,400/£1,550 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, Ta Denby Dale Rd, Wakefield, not later than 10 Nov., 1955.

No. 4 (Leeds) Sub-Area

Leeds District
ASSISTANT CONSUMERS ENGINEER (CHANGEOVER)

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications and must have had a thorough practical and technical education with a wide experience of both distribution and installation systems, particularly with regard to non-standard A.C. industrial supplies.

The successful applicant will be required to supervise a large staff engaged upon the work of conversion of all types of consumers installations and apparatus and should be capable of estimating costs in connection with this work. Ability to arrange details of changeover with large consumers is essential.

Salary—N.J.B. Class K, Grade 8, £900/£25/£975 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 10 Nov., 1955.

No. 7 (Grimsby) Sub-Area

Grimsby District
THIRD ASSISTANT DISTRICT ENGINEER

Applicants must possess at least the Higher National Certificate in Electrical Engineering and should have experience in the design, construction, operation and maintenance of H.V. and L.V. Overhead and Underground distribution systems, substation plant and ancillary equipment.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 10 Nov., 1955.

No. 6 (Hull) Sub-Area

Bridlington District
THIRD ASSISTANT DISTRICT ENGINEER (DRIFFIELD)

Applicants should have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Applicants should be Graduate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

The successful candidate will be required to reside in Driffield and undertake standby duty.

Salary—N.J.B. Class E, Grade 9, £635/£15/£680 per annum.

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Bridlington District
FOURTH ASSISTANT DISTRICT ENGINEERS

Applicants should have had experience in the construction, operation and maintenance of E.H.T. and L.T. overhead and underground distribution systems, in a mixed Urban and Rural District.

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications.

The successful applicants will be required to reside in Bridlington and undertake standby duty.

Salary—N.J.B. Class E, Grade 11, £555/£15/£600 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 10 Nov., 1955. (V 647)

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

1. SECOND ASSISTANT ENGINEER (SYSTEM DEVELOPMENT)—TECHNICAL DEPARTMENT KINGSTON

APPLICANTS should preferably be corporate members of the Institution of Electrical Engineers and possess an Honours degree. A thorough knowledge of Power System Technology, coupled with the ability to apply this knowledge to practical problems involving system and generator stability, the calculation of symmetrical and non-symmetrical short circuits, load flows, voltage regulation, etc. is essential. The work is concerned with the consideration of schemes of reinforcement to the High Voltage Transmission System and the connection of new Generating Stations, together with any other technological work which may be necessary. Class AX/DX, Grade 2, £950/£1,075/£1,165 per annum plus London Allowance.

2. ASSISTANT ENGINEER (WORKS OFFICE CO-ORDINATION)—CROYDON "A" AND "B" POWER STATIONS

The purpose of this position is to co-ordinate the work of operation, maintenance and other technical services, and includes responsibility for staff engaged upon the planning of plant maintenance and the development of new methods of working. The post offers exceptional opportunities to those having experience of maintenance in the engineering industry and of power plant operation. This is a new appointment calling for organising ability and the development of fresh ideas. Education up to Higher National Certificate is desirable. Class K, Grade 8, £900/£975 per annum plus London Allowance.

3. GENERAL ASSISTANT ENGINEERS (CONTROL)—LITTLEBROOK POWER STATION

Applicants should have had experience in the operation and control of Turbo-Generators and in Control Room duties. Class L, Grade 13, £715/£760 per annum and Grade 19, £475/£520 per annum plus London Allowance.

4. GENERAL ASSISTANT ENGINEER (CONTROL)—CROYDON "B" POWER STATION

For details of duties, seen No. 3. Class G, Grade 15, £475/£520 per annum plus London Allowance.

5. GENERAL ASSISTANT ENGINEER (CONTROL)—CROYDON "B" POWER STATION

For details of duties, seen No. 3. Class J, Grade 17, £475/£520 per annum plus London Allowance.

N.J.B. Conditions of Service. Written applications should be submitted according to location of vacancy to the following:

1. Establishment Officer, Central Electricity House, Lower Ham Rd, Kingston-upon-Thames.

2 and 5. Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon.

3. Station Superintendent, Littlebrook Power Station, Nr. Dartford, Kent.

Closing date 7 Nov. (V 657)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SENIOR ASSISTANT ENGINEER (RESIDENT) CASTLE DONINGTON POWER STATION

Vacancy No. 184/55/ET

The duties for the above position include general supervision of the erection and commissioning of all mechanical and electrical plant; for example, turbo-alternators and condensing plant, feed heating equipment, boilers, pumps, high pressure steam and feed piping, switchgear, transformers, and cables, coal and ash handling plant and ancillary equipment. Corporate Membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers would be a recommendation.

Candidates should be experienced in the supervision of such Power Station equipment, and in co-ordinating work on site in close collaboration with the Resident Engineer responsible for civil engineering and building works and with Divisional Headquarters staff.

The salary will be within Schedule C, Class AX/DX, Grade 1 (£1,100/£1,315 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 Nov., 1955.

SECOND ASSISTANT ENGINEER (MECHANICAL) CONSTRUCTION DEPARTMENT, CASTLE DONINGTON POWER STATION SITE

Vacancy No. 185/55/ET

Applicants should have had a fundamental training in Mechanical Engineering including workshops, together with experience in the manufacture and erection of heavy mechanical plant as installed in a modern Power Station. Experience in the operation and maintenance of H.P. Boiler plant will be an advantage. A University Degree or equivalent qualification in Mechanical Engineering would be a recommendation.

The salary will be within Schedule C, Class AX/DX, Grade 2 (£950/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 Nov., 1955.

PLANT CONTROL ENGINEERS DRAKELOW POWER STATION

Vacancy No. 188/55/ET

Vacancies exist at this modern Power Station working with advanced steam conditions for Plant Control Engineers.

Duties will consist of taking charge of operating duties concerned with a pair of 60 MW Unit Boilers and Turbines. Applicants should have had Station control room experience also experience with large capacity plant and possess technical qualifications up to at least Ordinary National Certificate standard. Certificated Marine Engineers would be considered.

Salary will be in accordance with Class J, Grade 10 (£755/£800 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 Nov., 1955.

STATION CHEMIST NORTH WILFORD POWER STATION

Vacancy No. 182/55/ET

Applicants should preferably hold the B.SC. degree in Chemistry, or be Associates of the Royal Institute of Chemistry, and must have had considerable experience in the chemical and physical testing of coal, oil and water, and in the application of the results of such tests to Power Station Operation.

Salary will be in accordance with Class K, Grade 7 (£975 x £25—£1,050 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 Nov., 1955.

SECOND ASSISTANT CHEMIST SPONDON POWER STATION

Vacancy No. 176/55/ET

Candidates must have had a sound technical training and some previous Laboratory experience and experience in the testing of coal, oil and water will be an advantage.

Preference will be given to candidates who hold the Higher National Certificate in Chemistry.

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Salary will be in accordance with Class H, Grade 11 (£675 x £15—£720 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Nov., 1955.

SENIOR DRAUGHTSMAN (ELECTRICAL) TRANSMISSION DEPARTMENT

Vacancy No. 180/55/ET

Experience on H.V. Electrical Equipment associated with Substations and Transmission Systems, including preparation of Electrical Diagrams, preferred but is not essential.

Salary will be in accordance with Grade 5 (£640 x £20—£740 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Nov., 1955.

MECHANICAL MAINTENANCE ENGINEER NORTH WILFORD POWER STATION, NOTTINGHAM

Vacancy No. 177/55/ET

Applicants should have received a sound technical training and wide practical experience in the maintenance of Generating Station mechanical plant and must be capable of planning and supervising mechanical plant maintenance.

Preference will be given to candidates who are Corporate Members of an appropriate professional Institution, or hold qualifications leading to such membership.

Salary will be in accordance with Class K, Grade 6 (£1,035 x £30—£1,125) per annum of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Nov., 1955.

GENERAL ASSISTANT ENGINEERS NORTH WILFORD POWER STATION, NOTTINGHAM

Vacancy No. 178/55/ET

The duties of this position are mainly to assist in the Station Control Room on shift, and to carry out such other operation and investigation duties as may be required.

Applicants should have had some previous experience in a Generating Station and preference will be given to those who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class K, Grade 15 (£595 x £15—£640 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Nov., 1955.

SHIFT CHARGE ENGINEER AVON POWER STATION, WARWICK

Vacancy No. 179/55/ET

Applicants should be suitably qualified and have had experience in the operation of modern boiler and turbine plant.

Salary will be in accordance with Class E, Grade 7 (£715 x £15—£760 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Nov., 1955.

SHIFT CONTROL ENGINEER DRAKELOW POWER STATION

Vacancy No. 175/55/ET

The minimum requirements are possession of the Higher National Certificate in electrical and/or mechanical engineering, together with experience in the control and load despatching of large capacity steam generating plant connected to the National Grid System.

Salary will be in accordance with Class J, Grade 10 (£755 x £15—£800 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Nov., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

21 Oct., 1955. (V 648)

METROPOLITAN BOROUGH OF BETHNAL GREEN

ELECTRICAL FITTER required. Pensionable post. Wages £9. 16s. 2d. per week. Further particulars and forms of application obtainable from Town Clerk, Town Hall, E.2, to whom completed forms must be returned by 14 Nov., 1955. Canvassing will disqualify. (V 624)

SOUTH WALES ELECTRICITY BOARD

require THIRD ASSISTANT (Industrial Supply), Commercial Department, Eastern Sub-Area (Newport).

The duties involved include the negotiation of important supplies to industry, general development of the industrial load and advice to industrial consumers upon utilisation of electricity.

Salary Class K, Grade 10 (£790/£850) of the N.J.B. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees to be addressed to the Secretary (Establishments Section) to arrive by 3 Nov., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (V 650)

CENTRAL ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following post:

SHIFT CHARGE ENGINEER OXFORD GENERATING STATION

S/13.677

Applicants should be in possession of technical qualifications admitting to corporate membership of a recognised professional institution, have had previous experience in an electricity generating station, and preferably have had manufacturing works experience.

Salary N.J.B. Grade D.7, £675/£720.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 9 Nov. Please quote reference ET. (V 654)

CENTRAL ELECTRICITY AUTHORITY
South Western Division

THIRD ASSISTANT ENGINEER (Control) required in the System Operation Department, Divisional Headquarters, Bristol.

Superannuation Scheme. Salary, N.J.B. Class AX/EX, Grade 4, £750 x £25—£875/£975.

Duties will cover load despatching and general shift duties in the Bristol Grid Area Control Room.

Applicants should be Graduates of the I.E.E. or equivalent and have had experience in a steam generating station.

Applications on Form AE6/ACT, obtainable from your place of employment or from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned to the Divisional Secretary by Wednesday, 9 Nov., 1955. (V 622)

THE EAST MIDLANDS ELECTRICITY BOARD
District Commercial Engineer, Boston District

APPLICATIONS are invited for the appointment of District Commercial Engineer in the Boston District of the Lincolnshire Sub-Area.

Candidates should have received a sound engineering and commercial training and be thoroughly experienced in the application and use of electricity for domestic, commercial, industrial and farming purposes. Experience of co-ordinating the work of several service centres and of a large contracting department is essential.

The successful candidate will be required to live in or near Boston and ability to drive a motor vehicle is essential.

The salary will be in accordance with Class E, Grade 4, of the National Joint Board Agreement, commencing at £840 per annum.

Applications stating age, qualifications, experience and present position, should be forwarded to the Manager, Boston District, Besco House, Boston, Lincs, within 14 days of this advertisement. (V 626)

ENGINEER

required by Mufulira Copper Mines Limited, Northern Rhodesia, to assist the electrical engineer in technical administration of electrical system comprising turbo-generators up to 30,000 kW total installed capacity, electric winders, electrolytic copper refinery, surface and underground reticulation, etc., and the power supply and distribution for a small town. Applicants should be under 35 years of age and should either hold a degree in electrical engineering or be a Corporate Member I.E.E. Good salary, plus cost-of-living allowance and substantial bonus. Also pension and life assurance scheme. Outward passage paid. Write, in confidence, giving qualifications and experience, to Mine Employment Department, Selection Trust Building, Mason's Ave, London, E.C.2. (V 643)

ASSISTANT MAINS ENGINEER

required by the Aden Government Electricity Department for one tour of 18 to 24 months in the first instance. Salary, according to qualifications and experience, in scale (including pay differential) £930 rising to £1,662 a year. Gratuity at the rate of £100/£150 a year. Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates must hold an H.N.C. in Electrical Engineering and have had sound practical training and considerable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/41239/EE. (V 642)

SOUTH WALES ELECTRICITY BOARD

require THIRD ASSISTANT ENGINEER in the Construction Department, Cardigan, Western Sub-Area.

Experience in the erection of H.V. and L.V. Overhead Lines for Rural Development and the knowledge of mechanised equipment is essential.

Salary—Class G, Grade 10 (£675/£720) of the N.J.B. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees to be addressed to the Secretary (Establishments Section) to arrive by 3 Nov., 1955. D. G. DODDS,
St. Mellons, Secretary,
Cardiff. (V 651)

LECTURER
(Electrical Trades)

required for the GOVERNMENT TECHNICAL INSTITUTE, BRITISH GUIANA, for appointment on contract for three years in first instance. Salary (including gratuity) up to £1,470 a year according to experience. Free passages. Liberal leave on full salary. Candidates must hold a City and Guilds Full Technological Certificate or H.N.C. in Electrical Engineering and have at least five years' industrial experience including electrical installation work. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/30229/EE. (V 644)

A CHARGEHAND ELECTRICAL FITTER with or without winding experience. Good opportunity for right man with repair shop experience of all types of electric motors. Good rate, 5-day week, overtime, bonus, etc.—Box No. 4879, Electrical Times. (V 448)

ALLEN WEST AND CO., LTD., require DRAUGHTSMEN aged 25-40, works trained and experienced in design and layout of control gear for electric traction. Staff pension scheme, five-day week, salary in accordance with age and experience. Applications in writing giving full particulars to the Chief Draughtsman, Allen West and Co., Ltd., Lewes Rd, Brighton. (V 567)

ASSISTANT MANAGER required for Plastics Division Cable Factory—London Area. 3 roomed flat with bathroom provided close to works.—Box No. 4895, Electrical Times. (V 518)

IMPERIAL CHEMICAL INDUSTRIES LIMITED
Wilton Works
ENGINEERS

CIVIL **STRUCTURAL**
MECHANICAL **ELECTRICAL**

Appointments are available for young engineers with honours degrees.

Wilton Works is a modern factory which is expanding rapidly and has vacancies for engineers on design, construction and operation, with opportunities of training towards higher management.

Wilton is in the North Riding of Yorkshire near the coast and has excellent recreation facilities including a golf course, squash courts, etc.

First class working conditions, five-day week, Pension Fund and Profit Sharing Scheme.

Out of pocket expenses are paid for applicants invited for interview and after joining the staff, married men will receive a refund of removal expenses up to £50 together with rail travel expenses. Schemes for assistance in housing are available, and for house purchase, facilities exist for loans and advances for legal charges.

Write for application form to:

STAFF MANAGER,
IMPERIAL CHEMICAL INDUSTRIES LIMITED,
Wilton Works, Middlesbrough,
quoting reference ICI/X/265 (V 635p)

A MAN of character and ability combined with experience and a desire to undertake responsibility is required for an important telephone cable sales and estimating department. Salary will be commensurate with experience and the appointment has good prospects, is permanent and pensionable. Typewritten applications should state salary expected and in chronological order details of experience with salaries received. All applications will be treated in the strictest confidence.—Box No. 4867, Electrical Times. (V 390)

AN ELECTRICAL ENGINEER is required to assist the Chief of Test, Rotating Electrical Machines Division, Brush Electrical Engineering Co., Ltd., Loughborough, Leics. The duties will be concerned with the planning and re-organisation of the test department. Applicants should hold qualifications suitable for corporate membership of the I.E.E., and have experience of machine testing. Knowledge of design and/or electronics advantageous. This is a good opportunity for a man having a flair for organisation and offers excellent prospects of advancement. Salary commensurate with qualifications and experience. Conditions include non-contributory superannuation. Please reply with full details to the Chief Personnel Officer. (V 658)

ASSISTANT ELECTRICAL ENGINEER, aged 20/27, with good knowledge of industrial lighting and power layouts required by large manufacturing firm in West London. Apply giving full particulars of qualifications and experience to—Box No. 4945, Electrical Times. (V 661)

CONTRACTS ENGINEER required by cable maker with headquarters in London. Applicants should preferably have ordinary national certificate, and must have had good experience in the installation of all types of power cables. A knowledge of overhead line construction would be an advantage. Apply—Box No. 4935, Electrical Times. (V615)

ENGLISH ELECTRIC VALVE CO.,

Chelmsford,

require

MICROWAVE ENGINEERS AND PHYSICISTS

for development work on Magnetrons, Travelling Wave Tubes, Klystrons, Image Orthicons and allied devices. Applicants should preferably be Graduates but others with sufficient practical experience will also be considered. Apply to Dept. C.P.S. 336/7, Strand, W.C.2, quoting Ref. 497N. (V 619p)

CROMPTON PARKINSON LTD. invite applications for appointments in their Overseas Division in London. One man is required to assist in the promotion (from London) of overseas sales of Lighting Equipment and applicants should have commercial experience in, and technical knowledge of, that product. Another man is required to assist in agency work and general co-ordination. He should have sound knowledge of export practices and some foreign languages. A background of engineering knowledge will be helpful. Excellent conditions, canteen, superannuation scheme. Applicants to Ref.: SXG, Crompton House, Aldwych, London, W.C.2. (V 606)

DRAUGHTSMEN. John and Phillips Ltd. have vacancies in their Contract Department for Draughtsmen having experience in Power Station installation work, light construction, cable racking and overhead line work. Applications stating age, training and experience to Manager, Employment Department, Victoria Works, Charlton, London, S.E.7. (V 618)

ELECTRICAL ENGINEER AND ARMATURE WINDER for British Mining Company, Red Sea area of Egypt. Practical man capable of installing and maintaining mainly D.C. electrical plant, with local assistants. H.N.C. preferred. Three year contract, renewable, passages paid, including family, free housing, light, water, fuel, medical attention. Contributory pension scheme. Salary £800 per year.—Box No. 4949, Electrical Times. (V 663)

ELECTRICAL cable manufacturers in the Manchester area require a young Electrical Engineer of degree standard to carry out development work into the designs, materials and processes used in high voltage cable manufacture. The work requires a high degree of initiative and a good salary will be paid for an engineer of suitable qualifications and personality. Staff Pension Fund. Apply—Box No. 4929, Electrical Times. (V 607)

CONTRACT ENGINEER

fully experienced in the making out of specifications and documents for invitations to tender in the field of steam power stations and power station equipment is required for Brussels engineering department of very important Belgian electricity holding company.

Control of French language necessary.

Attractive salary and pension scheme.

Applications stating age, family, qualifications, experience, to

ELECTROBEL,
1 Place du Trône,
Brussels (Belgium).

(V 608p)

ENGINEER IN CHIEF

Applications are invited for the post of Engineer in Chief . Brush Electrical Engineering Company Limited, Loughborough, a subsidiary of the Brush Group Limited.

Applications for this appointment, which will be of Director status, should have the necessary experience to enable them to carry full responsibility to the Managing Director for the production design of the company's various products. Engineers possessing the appropriate qualifications, who would like further details of the appointment and conditions of service, which will include participation in a non-contributory pension scheme and assistance with housing expenses, are invited to submit brief details in strict confidence to Mr Miles Beevor, the Chairman, Brush Electrical Engineering Co., Ltd., Duke's Court, 32 Duke St, St. James's, London, S.W.1. (V 631p)

ELECTRICAL MOTOR DESIGNER required by centrifugal pump manufacturers. Must be experienced in the design and development of medium-sized A.C. and D.C. machines, submersible type motors, etc. Excellent opportunity for qualified, enthusiastic and practical man to improve established and internationally known machines, and to introduce new ideas. The post is one of responsibility and salary will be in accordance. Please send full details, including age, qualifications and experience, to The General Manager, James Beresford and Son Ltd., Stork Works, Kitts Green, Birmingham 33. Applicants may be assured that their replies will be treated as fully confidential. (V 513)

ELECTRICAL Manufacturing Company in Central London require an EXPERIENCED MAN capable of handling quotations and tenders for Street Lighting Equipment. This is a progressive position and a senior appointment. 5-day week. Pension Scheme.—Box No. 4917, Electrical Times. (V 547)

FOSTER TRANSFORMERS LTD., South Wimbledon, London, S.W.19, have vacancies for DESIGNERS and DRAUGHTSMEN with experience of small transformers. Apply giving full details of experience and salary expected to the Personnel Officer. (V 504)

EXPERIENCED TRANSFORMER DESIGNER required in the Manchester district. Technical qualifications up to University Degree standard. Practical experience should include work on distribution and medium power units. Salary level £1,000 per annum approximately, depending on qualifications. Reasonable assistance will be given to obtain a house. Apply stating age and experience to—Box No. 4925, Electrical Times. (V 597)

FORD MOTOR COMPANY LIMITED, of Dagenham, Essex, have a vacancy in their Power Department for a MECHANICAL ENGINEERING DRAUGHTSMAN. He should have experience of High Pressure Boilers, Turbine and ancillary equipment, together with associated H.P. high temperature steam piping and feed lines. Higher National Certificate essential.

This is a well paid post with participation in a generous non-contributory pension scheme. Please reply to Salaried Personnel Department quoting reference DMT. (V 566)

LARGE Electrical Manufacturers in Central London area require the services of a STREET LIGHTING ENGINEER, aged about 35. Must be conversant with all aspects of street lighting. This post offers considerable prospects. 5-day week. Pension Scheme. Canteen.—Box No. 4931, Electrical Times. (V 613)

LARGE Electrical Manufacturers in Central London area require the services of a JUNIOR STREET LIGHTING ENGINEER, aged about 28. This post offers considerable prospects to an ambitious young man. Knowledge of estimating and planning. 5-day week. Pension Scheme. Canteen.—Box No. 4933, Electrical Times. (V 614)

MEDIUM-SIZED Electrical Accessory Manufacturers of high repute require live AGENTS for the following territories:
(*a*) Area operated by the South Wales Electricity Board.
(*b*) Area operated by the South West Electricity Board.
Reply giving full details of facilities offered, to Sales Manager.—Box No. 4889, Electrical Times. (V 459)

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., require the services of an EXPERIENCED ESTIMATOR for their Valve and Tube Engineering Dept. Applications are invited from men about 30 years of age with experience of estimating for batch production. The post is permanent and pensionable and a good starting salary will be paid to a suitable person. Applications giving full details to: X-Ray Engineering Dept., 68 Ballards Lane, Finchley, N.3. (V 479)

MIDDLE EAST department of Société Engetra, Brussels, invites applications for a qualified DRAUGHTSMAN conversant with steam power houses and networks. Salary £110 Sterling or equivalent local currency, tax free, house accommodation and heavy furniture. Three months' leave home after two consecutive summers abroad, travelling expenses for himself and family if married.—Box No. 4919, Electrical Times. (V 588)

MAN with experience of materials used in electrical contracting required in old established Contractors' office for Pricing and Accounts Department. Excellent prospects. Apply in writing to Barlow and Young Ltd., 55 Catherine Place, S.W.1. (V 660)

METER Manufacturers, N.W. London, require SENIOR AND JUNIOR TEST ENGINEERS for progressive posts in their Test Depts. Write stating education, technical training, experience, salary required, to Box "S.N.", c/o J. W. Vickers and Co., Ltd., 7/8 Great Winchester St, E.C.2. (V 589)

OVERHEAD LINE ENGINEERS, fully experienced in the design of 11 kV and 33 kV lines, with practical field experience, men with office experience only would be considered, required for Scottish Office of electrical engineers. Good salary and prospects, superannuation, removal expenses, if necessary. Apply giving full particulars, age, married or single, and salary required, all in strict confidence to—Box No. 4951, Electrical Times. (V 664)

DRAUGHTSMEN

M.K. Electric Ltd. require Draughtsmen, preferably with experience in the specialised field of electric wiring accessories. Permanent posts and good salaries are offered with this established and expanding Company. Write in full confidence giving age, qualifications, experience and salary required to:

General Works Manager, M.K. Electric Ltd., Wakefield St., Edmonton, N.18.

(V 599p)

RESEARCH ENGINEERS

A number of new appointments are to be made in the

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Applications should be sent to:
Dept. C.P.S.,
336/7 Strand, W.C.2
quoting Ref. No. 1417A
(V 540p)

PIRELLI-GENERAL Cable Works Ltd. require DRAUGHTSMAN for design work on Foundations and Structural Steelwork. Interesting post on new work offering good prospects. Apply in writing, giving qualifications, experience, age and salary expected to: The Manager, Overhead Lines Department, Eastleigh, Nr. Southampton, Hants. (V 445)

PIRELLI-GENERAL Cable Works Ltd. require DRAUGHTSMAN with knowledge of Structure Design. Overhead Railway Electrification experience an advantage. Post offers excellent prospects. Salary according to age and experience. Applications to: The Manager, Overhead Lines Department, Eastleigh, Nr. Southampton, Hants. (V 444)

SALES ENGINEERS required for the Indoor Sales Staff. Applicants must have had a sound technical training and previous experience in dealing with enquiries relating to A.C. and D.C. rotating plant and control gear up to 1,500 h.p./kW. Sick Benefit Schemes. Superannuation Scheme. 5-day week. Canteen, social and welfare facilities. Apply stating age, whether married or single, and giving full details of previous experience and training to Personnel Officer, Crompton Parkinson Ltd., Chelmsford, Essex. (V 541)

REPRESENTATIVE for London, N.W., out to Reading, Oxford, Dunstable, etc., required by old established Electrical Wholesalers. Age 30/40. With connection and experience with leading Contractors and Stores. Men with proved experience only need apply, stating in confidence, age, remuneration, experience, etc.—Box No. 4923, Electrical Times. (V 591)

STANDARD TELEPHONES AND CABLES LTD., North Woolwich, London, E.16, require ENGINEER to work on the development of a wide variety of high frequency and audio testing equipment in a tele-communications laboratory associated with the design of telephone and television cables. The laboratory is small but very well equipped with ready access to all the facilities of a large organisation. Applicants should be of University degree standard and some electronic experience is desirable. Write, stating age, qualifications and salary required to Personnel Manager. (V 616)

A FUTURE WITH FORD

Ford Motor Co., Ltd., of Dagenham, Essex, have now opportunities for power station draughtsman with the right experience. Could you fill one of these vacancies?

1. A SENIOR ELECTRICAL DRAUGHTSMAN, who can prepare drawings for the layout and cabling of Power House Equipment, Substation Layouts, Electrical Networks Schematic Diagrams, etc. Capable of taking off quantities and preparations of specifications.
2. A JUNIOR ELECTRICAL DRAUGHTSMAN who has already some experience of these duties.

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(V 609p)

SALES ENGINEER required for medium-voltage switchgear for home market. The switchgear concerned has industrial applications and is ideally suitable for the control of power station auxiliaries, etc. Contributory pension scheme in operation. Write giving particulars of experience, age and salary required to—Box No. 4937, Electrical Times. (V 617)

TECHNICAL DESIGNER AND DESIGNER DRAUGHTSMAN required with knowledge of production of light to medium electro and mechanical products. Please reply stating full particulars experience, age and salary required to Salford Electrical Instruments Ltd., Times Mill, Heywood, Lancs. (V 632)

TECHNICAL SALES REPRESENTATIVES. Manufacturers supplying insulating materials to electrical industry require representatives for Scotland, North-East and South-West England. Apprenticeship or works experience and minimum of Ordinary National Certificate, but higher qualifications and experience an advantage. Outside selling experience not essential. Permanent position with ample scope for advancement. Salary commensurate with age, qualifications and experience. Write giving full personal particulars, qualifications and details of previous positions to—Box No. 4947, Electrical Times. Our staff already notified of this advertisement. (V 662)

TEST ENGINEERS required for type testing and quality testing. Applicants should hold Ordinary National Certificate or exemption. Those taking third year of O.N.C. Course would be considered. Staff superannuation scheme. Staff Canteen. Five-day week. Write giving full details of age, experience and qualifications to: Personnel Department, Rotax Ltd., Chandos Rd, Willesden Junction, N.W.10. (V 446)

TECHNICIAN required by the Atomic Weapons Research Establishment, Aldermaston, Berks, to give technical advice on the purchase of a wide variety of electrical and electronic stores and equipment. Documentation and work on standardisation in conjunction with other branches. Some supervision of subordinates' work will be necessary. Applicants should have served a recognised apprenticeship and have had subsequent practical experience. Possession of O.N.C. or equivalent qualification is desirable.

Salary: £743 per annum (linked to age 30)—£873 per annum (male). Contributory Superannuation scheme. Successful married officers now living outside the Establishment's transport area will be eligible for housing on one of the Authority's estates; until housed a lodging allowance may be payable.

Requests for application forms by postcard to the Senior Recruitment officer at the above address. Quote Ref. 779/49.
(V 600)

TECHNICAL ASSISTANT (JUNIOR) required by industrial firm in West London. Must have qualifications to degree or A.M.I.E.E. standard and some practical experience of installation work H.V. and L.V. distribution modern control gear, process control methods. Knowledge of electronics and illuminating engineering advantageous. Write stating age, qualifications, experience and salary required, to—Box No. 4943, Electrical Times. (V 659)

THERE are vacancies in the Rand and O.F.S. Undertaking Power Stations of the Electricity Supply Commission in the Union of South Africa for:

CONTROL ENGINEERS,
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JUNIOR SHIFT ENGINEERS,
DISTRICT ASSISTANTS,
SWITCHBOARD ATTENDANTS,
ENGINEERING ASSISTANTS,
for Mechanical Test Department,
POWER STATION CHEMISTS.

Good salaries and generous service conditions are offered and all positions afford good prospects of advancement to men of ability, energy and initiative. Rail and sea passages will be provided for selected applicants, their wives and minor children, subject to agreement to serve the Commission for at least three years. For full particulars apply to the London Representative, Electricity Supply Commission, 723 The Adelphi, John Adam St, London, W.C.2. (V 604)

TRANSFORMER DRAUGHTSMAN (25-38 years) required with good experience in all types of power transformers up to 5 MVA. Applicants should be capable of working on own initiative with a minimum of supervision. Housing accommodation is available and the company operate a superannuation scheme. Full details including age, experience and salary required to Lindley Thompson Transformer Co., St. Mary's Rd, Slough. (V 596)

TECHNICAL SALES REPRESENTATIVE required by an old established Company situated N. London, engaged in the manufacture of specialised switches and electrical equipment, and which has embarked on a policy of expansion.

Applicants must have a technical training and background sufficient to enable them to intelligently discuss technicalities with customers, an engaging personality and the ability to negotiate at all levels. Previous selling experience and established trade contacts are desirable but not essential if other conditions are fulfilled.

The position offers interesting employment, good prospects and the remuneration will be commensurate with abilities. Applications, which will be treated in the strictest confidence, must provide full details of the applicant's education and history and addressed to General Manager—Box No. 4939, Electrical Times. (V 633)

YOUNG ENGINEER with electrical and mechanical training is required by Consulting Engineers in Westminster. The work is interesting and varied, and there are good prospects for suitable applicants.—Box No. 4941, Electrical Times. (V 634)

APPOINTMENTS WANTED

ELECTRICAL, MECHANICAL ENGINEER, M.I.E.E., wide experience, desires to represent reputable firm South Coast, and/or S.E. Area.—Box No. 4905, Electrical Times. (V 529)

ENGINEER, A.M.I.E.E., aged 30, power station, and sales and contract experience of distribution equipment. Manufacturer (sales) or consultant in South preferred. Short term engagement considered.—Box No. 4883, Electrical Times. (V 450)

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AGENCIES

REPRESENTATIVE established connections at all levels, Gas, Electricity Boards and Manufacturers, London and Home Counties, invite enquiries from manufacturers desiring representation, full or part time.—Box No. 4907, Electrical Times. (V 530)

PATENTS

THE proprietor of British Patent No. 626068, entitled "Improvements in or relating to automatically controlled electrical pumping units" offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Blvd, Chicago 4, Illinois, U.S.A. (V 548)

BUSINESS OPPORTUNITIES

OLD established Company in the London area, with productive capacity and finance available, is interested in associating with a Company engaged in research and development of precision engineering products suitable for quantity production. Negotiations will be with Managing Director and treated in strictest confidence. Write Box "N.P.", c/o J. W. Vickers and Co., Ltd., 7/8 Great Winchester St, E.C.2. (V 549)

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continued on page 68

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THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

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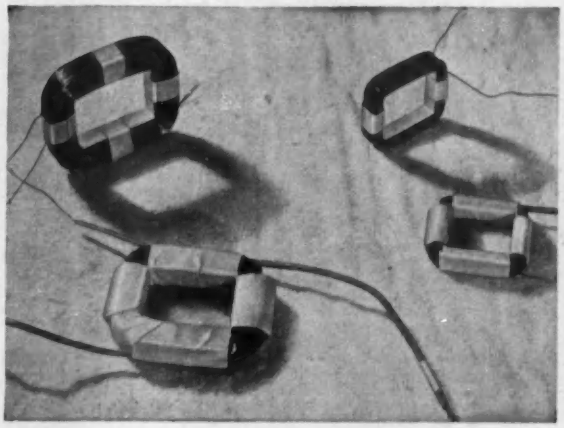
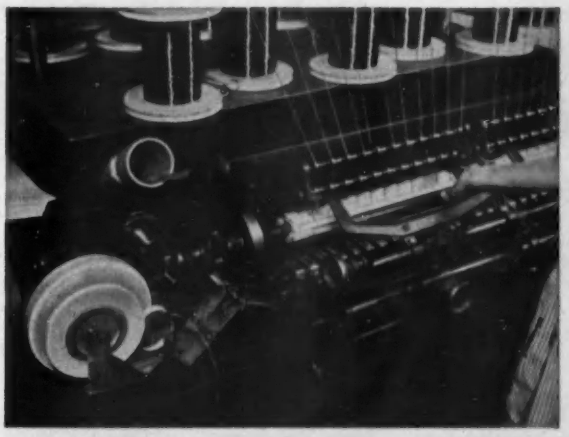
Notice is hereby given that the A.S.E.E. Diploma Examination, and the Technician's Certificate Examination will be held at Centres on 23 and 24 May, 1956, the subjects for both examinations being Electrical Installation Practice and Electrical Maintenance. The Diploma Scheme provides for the award of premiums.

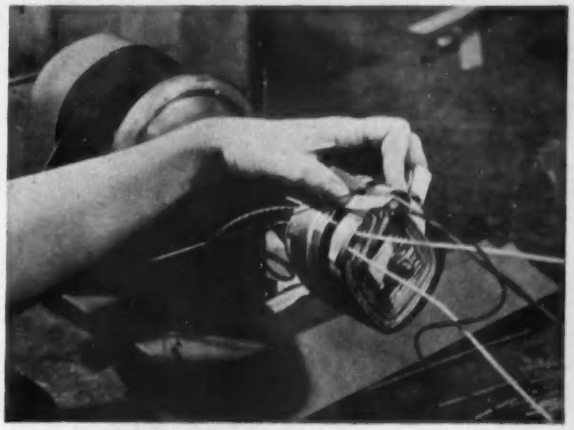
Application forms and details of examinations may be obtained from the General Secretary, The Association of Supervising Electrical Engineers, 23 Bloomsbury Sq, London, W.C.1.

The latest date for receipt of application forms is 1 Mar., 1956.

E. A. BROMFIELD,
General Secretary.
(V 620p)







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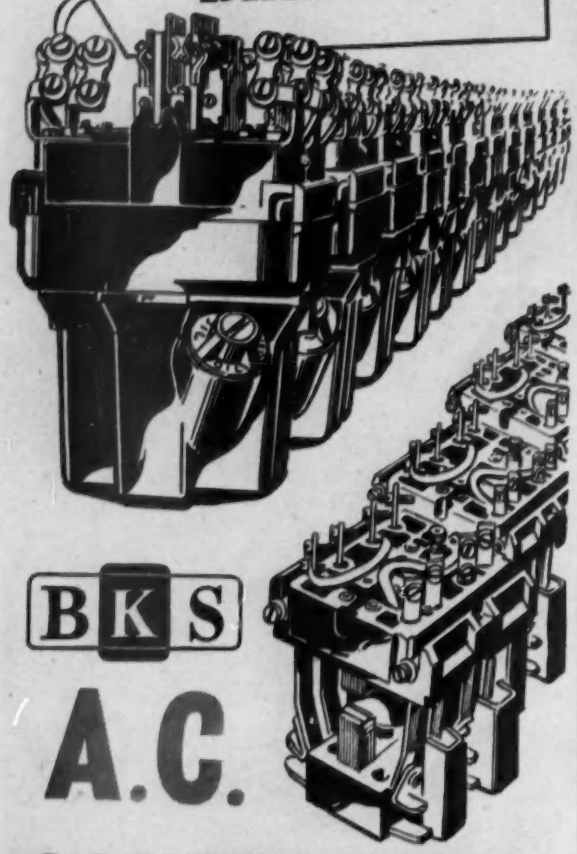

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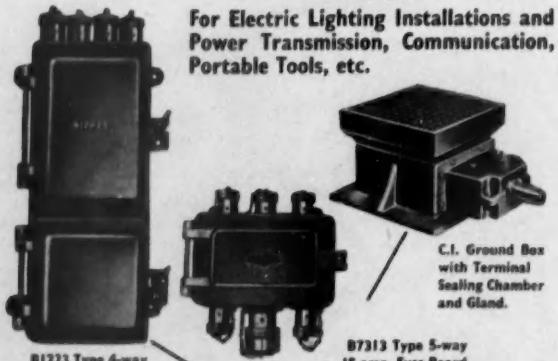

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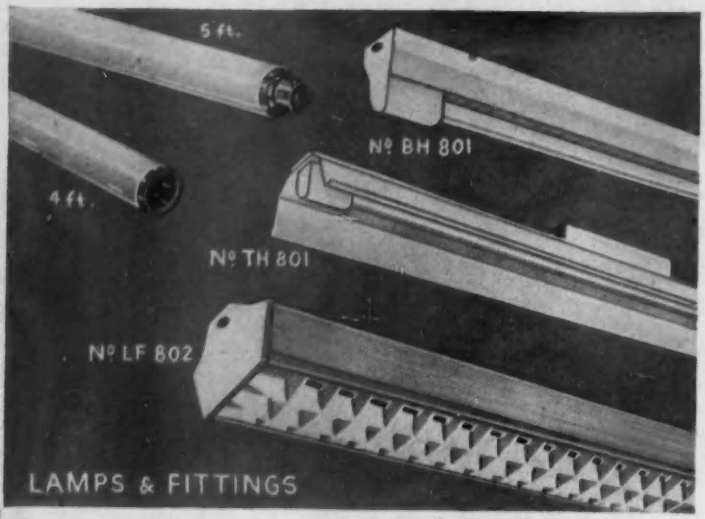

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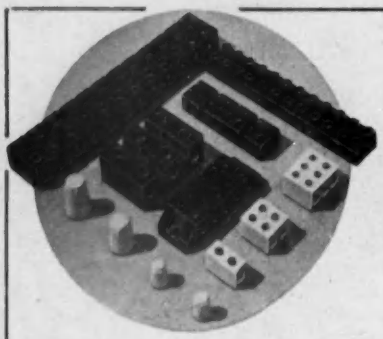

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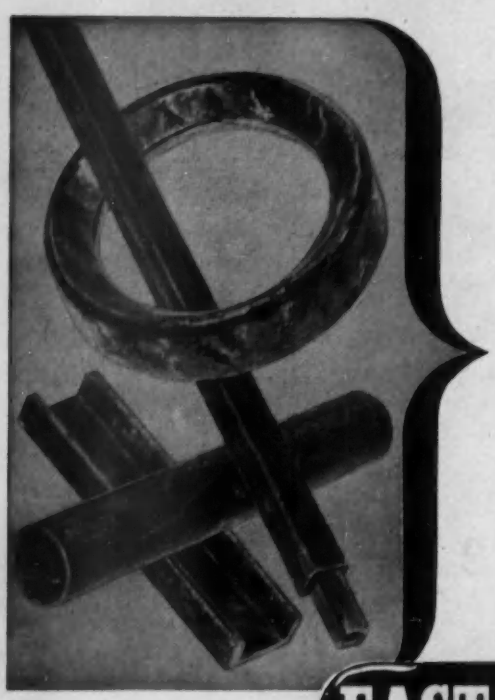

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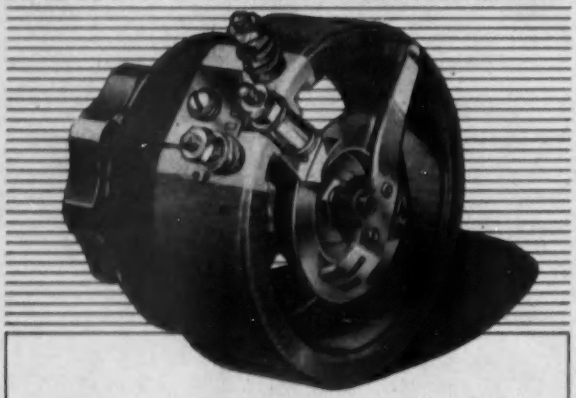

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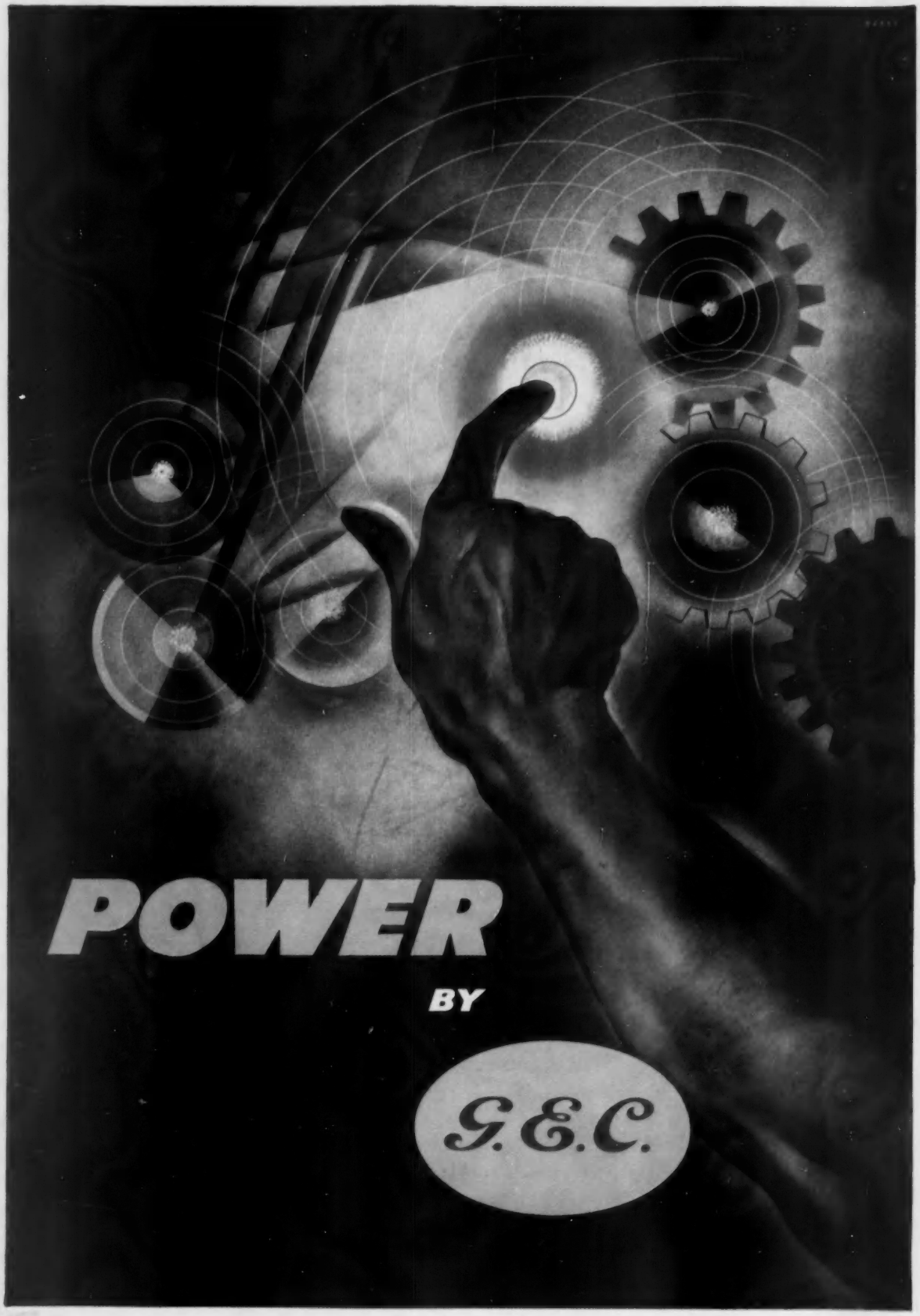
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